

4.0 ENVIRONMENTAL CONSEQUENCES

This chapter of the ISRP DEIS describes the potential environmental impacts to the pre- and post-construction conditions in the developed and natural environment that could result from the implementation of NASA's proposed action. The information in this chapter is based on the best information available and addresses cumulative impacts on KSC and the nearby communities over a 20-year period. The environmental consequences of each alternative are analyzed and presented for the following resources:

- 4.1 LAND USE
- 4.2 ATMOSPHERIC ENVIRONMENT
- 4.3 AMBIENT NOISE
- 4.4 GEOLOGY AND SOILS
- 4.5 HYDROLOGY AND WATER QUALITY
- 4.6 BIOLOGICAL RESOURCES
- 4.7 SOCIOECONOMIC
- 4.8 CULTURAL RESOURCES
- 4.9 RELATIONSHIP AND COMMITMENT OF RESOURCES

4.1 LAND USE

This section describes the environmental consequences of general land use changes within KSC, the ISRP alternative sites, and the surrounding area that could be affected by development activity

4.1.1 Standards of Significance

An alternative for the ISRP EIS would have a significant impact on land use if it would:

- Introduce an activity that is outside of the interest of the Nation's space operations or the public benefit.
- Create uses that are incompatible with land uses planned under the Cape Canaveral Spaceport Master Plan (2002) or the KSC Master Plan.
- Conflict with existing facility operations and public safety at KSC.

4.1.2 Impacts Discussion

This section discusses potential conflicts with existing and planned land uses for KSC and the surrounding area for each of the three alternatives. The land use analysis addresses two different kinds of impacts. The first type of impact involves direct conflicts between the land uses included in the alternatives and the existing and planned land uses within the surrounding area. Direct conflicts could arise if new uses generated substantial amounts of noise, pollution, or types of traffic that significantly impacted surrounding areas. The direct conflicts between new and existing land uses are addressed in this section, and mitigation measures are proposed.

The second type of impact involves the indirect or secondary effects of proposed new development. Secondary impacts generated by the new land uses include: 1) air quality impacts, 2) loss of wildlife habitat, and 3) increased traffic congestion. These secondary impacts are discussed briefly. Detailed analysis and mitigation measures are discussed in the relevant resource sections, such as Section 4.2 Atmospheric Environment, Section 4.6 Biological Resources, and Section 4.7.7 Transportation.

4.1.2.1 No Action Alternative

Under the No Action Alternative, no additional land uses with noise, air quality, or heavy truck traffic impacts would be introduced. Therefore, no conflicts with established uses at KSC or in the surrounding communities of Merritt Island, Cape Canaveral, and Titusville would occur.

4.1.2.2 Alternative 1 (Phases A-E) and Phase F

The proposed land use plan for Alternative 1 (Phases A-F) is shown in Figure 2.1. The potential for significant direct and indirect impacts on land use would be minimized due to several contributing baseline and development design factors:

1. The development study has proposed that the ISRP be developed in phases, requiring each phase to have 75 percent build-out and 75 percent occupancy prior to any new construction in subsequent phases (Futron, 2002).
2. The proposed land uses are similar to those that already exist at KSC. Land uses proposed for Alternative 1 (Phases A-F) include offices, R&D laboratories, educational facilities and light industry. The location of Alternative 1 (Phases A-F) poses no new conflicts with existing land uses or facility operations.
3. The location of Alternative 1(Phases A-F) is outside of NASA and US Air Force designated Impact Limit Lines for all launch activities and Quantity Distance demarcations of hazardous storage facilities at KSC and the CCAFS, resulting in a very limited risk to the public working within the proposed ISRP facilities.
4. Indirect impacts related to increased traffic and air quality may occur during the construction and occupation of the ISRP facilities. However, development would be carried out over a 20-year period so that construction impacts would occur in short time frames and changes in traffic would be gradual and consistent with local and regional transportation planning. Details of these potential impacts are discussed in respective sections of this chapter.

a. Construction-Related Impacts

1. *Removal of Land from MINWR*

Development of Alternative 1(Phases A-F) would require the removal of the land from MINWR in five stages. The removal of land from MINWR would reduce the land acreage under refuge management by 0.3 percent, which is not considered significant based on the metrics described in Section 4.1.1 Standards of Significance. Specifically, this land would be used for space related activities. Most of this land is currently in citrus production. Loss of agricultural land uses from MINWR is not considered to be a significant impact since maintenance of citrus is currently conducted by contractors and is not within the mission of the USFWS refuge system. Land managers at MINWR have discussed removing agricultural land uses from the MINWR with the intention of restoring these areas to natural communities.

2. *Land Use Alteration*

Approximately 76 percent of the Alternative 1 (Phases A-F) site is developable. Concentrated development is favorable within conservation areas and wildlife regions such as MINWR. The site is accessible by Space Commerce Way; therefore, new infrastructure would not be required for access to the site. Most utilities are also within proximity of Alternative 1.

Development would result in the net loss of approximately 107.3 ha (265.2 ac) of citrus grove, 99.7 ha (246.4 ac) from Alternative 1 (Phases A-E) and 7.6 ha (18.8 ac) from the Phase F parcel, over the proposed 20-year development period. Some of the groves are currently under a citrus management lease through 2008 to the Kerr Foundation for Sustainable Agriculture (Kerr 2002). Removal of the land from MINWR prior to the expiration of the MOU with Kerr Foundation would require an amendment to the existing land management agreement (Table 4-1). Conversion of the Alternative 1 (Phases A-E) site to the ISRP would result in the land not being available for other uses by NASA for the term of the lease with the State, which is proposed to be 50 years with a possible 25-year extension. To reclaim this land for NASA's use during this period, NASA would either have to amend the lease or exercise its option to terminate the lease and convert to the desired use. At the end of the lease or any extensions FSA would remove all improvements made upon the leased land except for permanent improvements to site drainage, landscaping, interior roadways and utility infrastructure. In accordance with the anticipated agreement between NASA and the State, NASA may at its sole discretion, waive the required removal of part or all of the above referenced improvements

Table 4-1. Proposed Development Phases and Existing Land Use Restrictions for Alternative 1(Phases A-F)

Phase	Parcel Area		Area of Citrus in Lease through 2008 ¹		
	Hectares	Acres	Hectares	Acres	Percent
A	21	53	0	0	0%
B	24	59	5	12	20%
C	26	64	10	25	39%
D	32	79	25	61	77%
E	26	65	16	39	61%
F	10	25	3	6	25%
TOTAL	139	345	59	143	42%

¹ Area does not include the development of ISRP roads (JEA 2002).

b. Operational-Related Impacts

1. *Management of ISRP Land Prior to Development*

The ISRP would be developed in phases. Land removed from MINWR would become the responsibility of KSC until the land is transferred to FSA. Land management of the parcels within each leased phase of the ISRP would be the responsibility of the ISRPA. Some land management may be required on parcels during each development phase to remove invasive shrubs and grasses or reduce fuel loads and wildfire risk. Impacts to on-going management of the landscape surrounding the development parcels would not be significant.

4.1.2.3 Alternative 2 and Phase F

The proposed land use plan for Alternative 2 (Phases A-E), not including the Phase F parcel, is shown in Figure 2.2. Because the ISRP development criteria for Alternative 2 (Phases A-E) and

the Phase F parcel are the same as for Alternative 1 (Phases A-F), many of the potential land use impacts are similar and have not been repeated in detail.

1. The proposed land uses are similar to those that already exist in KSC and have been described under Alternative 1 (Phases A-F). The location of Alternative 2 (Phases A-F) poses no conflicts to existing land uses or facility operations.
2. The locations of Alternative 2 (Phases A-E) and the Phase F parcel are outside of the Impact Limit Lines for all launch activities and the Quantity Distance demarcations of hazardous storage facilities at KSC and the CCAFS, resulting in a very limited potential risk to the public working within the proposed ISRP facilities. Any changes in the launch operations that would affect the Impact Limit Lines would affect the KSC Industrial Area before the ISRP and would therefore be addressed in that context prior to addressing impacts to the ISRP operations or personnel. There are no known new launch vehicles that would change these lines in the foreseeable future.
3. Indirect impacts may occur due to increased traffic and affects to air quality during the construction and operation of the ISRP facilities. These impacts would be the same as those discussed in Alternative 1 (Phases A-F).

a. Construction-Related Impacts

1. *Removal of Land from MINWR*

Land within Alternative 2 (Phases A-E) would be required to be removed from MINWR. Removal of the land from MINWR would reduce the land acreage under refuge management by 0.3 percent. Loss of these natural communities from within MINWR would be a significant impact. Details of this impact are presented in Section 4.6: Biological Resources.

2. *Land Use Alteration*

Because of extensive natural communities, only 57.5 percent of Alternative 2 (Phases A-E) is considered appropriate for development. This site has limited infrastructure and would require new infrastructure for access from Kennedy Parkway at the intersection of B Ave SW (Tel-4 Rd.). Development at Alternative 2 would result in the loss of approximately 111.6 ha (275.8 ac) of natural communities, dominated by scrubby pine flatwoods and wetlands. Development impacts at the Phase F parcel are approximately 9.9 ha (24.4 ac).

b. Operation-Related Impacts

1. *Management of ISRP Land Prior to Development*

The ISRP would be developed in phases. Land removed from MINWR would become the responsibility of KSC until the land is transferred to FSA. Land management of the parcels within each leased phase of the ISRP would be the responsibility of FSA. Some land management may be required on parcels during each development phase to remove invasive shrubs and grasses or reduce fuel loads and wildfire risk. Impacts to on-going management of the landscape surrounding the development parcels would not be significant.

4.1.2.4 Surrounding Region

No potential direct or indirect land use related impacts have been identified on the surrounding municipalities of the City of Titusville, the City of Cape Canaveral, or the unincorporated community of Merritt Island. Land uses that are similar to those proposed within the ISRP are found in the near-by communities and counties. The region is growing generally. Housing development is occurring. ISRP development would not impact projected growth rates.

4.1.3 Cumulative Impacts

This section considers the impacts on the environment, which would result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR §1508.7). The cumulative projects being considered under this analysis are listed in Chapter 2 Section 2.2 Baseline Conditions. Development within the area is generally expanding and no cumulative impacts related to land use, overall zoning, and land management objectives have been identified as a part of the proposed ISRP development.

Regarding development contemplated in the NASA long term planning documents, given the speculative nature of these plans, it is difficult to quantify the effects the implementation of the plan would have on KSC and the surrounding environs. However, the Cape Canaveral Spaceport Master Plan addressed three planning horizons; 30 years, 50 years and 75 years. Given the expected build out of 20 years for the ISRP, it is appropriate to address the expected effects of the 30- year planning horizon of this plan.

The 30-year horizon envisions essentially full build out of the ISRP, some additional payload processing facilities and some additional office space 7,154 Square meters (77,000 square feet). This is contained within the full build out capacity of the ISRP. There is also the possibility of an additional launch vehicle in use that either augments or replaces the Space Shuttle. Most of the expected development for these activities would occur either within the ISRP, or the KSC Industrial Area, an area designated for development and not managed for wildlife or in the KSC Visitors Complex. Given these facts, the overall cumulative effects of these activities are considered minimal to land use on KSC.

4.1.4 Impacts and Mitigation Measures

No significant impacts related to land use have been identified. Secondary impacts that relate to land use are discussed elsewhere within Chapter 4 Environmental Consequences.

4.2 **AIR QUALITY**

This section describes the environmental consequences of the proposed ISRP on air quality within KSC, the ISRP alternative sites, and the nearby surrounding area.

4.2.1 Standards of Significance

Development of the ISRP was determined to have a significant impact on air quality at the alternative development sites and surrounding region of influence if it would:

- Produce threshold quantities for any individual emissions unit or activity that emits or has the potential to emit (Chapter 62-213.300(2) F.A.C.) 500 pounds per year or more of lead and lead compounds, 1,000 pounds per year or more of any hazardous air pollutant (HAP), 2,500 pounds per year or more of total HAPs, or 5 tons per year or more of any other regulated pollutant, and require an individual construction permit prior to construction.
- Produce threshold quantities as a facility that emits or has the potential to emit (Chapter 62-213.300(2) F.A.C.) 5 tons per year or more of lead and lead compounds, 10 tons per year or more of any HAP, 25 tons per year or more of total HAPs, or 100 tons per year or more of any other regulated pollutant, and require a construction and an operating permit.

Tenants of the ISRP would be included in the KSC Title V Operating Permit if their operations were directly supporting NASA missions or under NASA contracts. For other operations, these tenants would apply for their own operating permit if they would have any significant sources, operations, or processes. Other permits (Chapters 62-4, 62-210, 62-212, F.A.C.) are required for all operations that have the potential to emit air pollutants to the atmosphere over the threshold quantities. This includes state construction and new source review (NSR) and prevention of significant deterioration (PSD) permits.

4.2.2 Impacts Discussion

The potential for significant impacts on air quality is very limited, although some impacts may occur from construction and operation of the ISRP. The potential impacts to air quality would be the same for each of the action alternatives.

4.2.2.1 No Action Alternative

Under the No Action Alternative, no new development would occur in either Alternative 1 (Phases A-F) or Alternative 2 (Phases A-F). There would be no new direct impacts on air quality under this alternative.

4.2.2.2 Alternative 1 (Phases A-E), Alternative 2 (Phases A-E) and Phase F

The potential for significant direct and indirect impacts related to air quality has been minimized through several design and development considerations under both Alternatives 1 and 2.

1. The ISRP proposes only R&D, technology development, and limited commercialization activities. Environmental concerns would, thus, be limited to exhaust generating devices.
 2. Development of the ISRP would be phased over a 20-year period. Phasing would reduce the intensity of construction-related impacts. Each development phase would require 75 percent build-out of the parcels and 75 percent occupancy of the facilities. Operational impacts related to increased traffic would also be phased in over the development period.
- a. Construction-Related Impacts
1. *Emission of particulate matter (PM) from construction activities*

The air quality impacts of the project would come mainly from PM emissions from construction activities. Construction activities are the principal source of impact to air quality due to reduction of ground cover and exposure of sediments to weather and construction vehicles. Dust emissions of PM and PM less than 10 microns in diameter (PM₁₀) would occur during construction. PM emissions from construction are a significant, but short-term impact to air quality.

2. Increased traffic during construction phase

When comparing the amount of emissions from the current use of automobiles on KSC, the increase of emissions related to traffic from construction equipment and traffic would be negligible. Therefore, the increase in emissions based on the increase in construction vehicles and equipment would be considered insignificant.

3. Burning of debris from land clearing activities

The use of controlled burns to dispose of ground cover from land clearing activities is a common practice in Florida. Burning debris emits smoke and ash into the air, reducing air quality. Open burning is a regulated activity and requires mitigation, which includes strict adherence to specific procedures and criteria to be followed during the burning activities.

b. Operation-Related Impacts

1. Exhaust generating devices

Because the exact types and quantities of exhaust generating devices for the ISRP are not known, this section addresses reasonably foreseeable air quality impacts from boilers, hot water generators, and backup electric generators and non-toxic substances often associated with laboratories and R&D activities. Emissions that may significantly reduce air quality are commonly managed at laboratories and R&D businesses. The capacities for typical operations of the size proposed in the ISRP action are estimated to be small and have low fuel usage. For that reason, the emissions are estimated to have minimal air quality impacts and these would most likely be below significant threshold levels. The ISRP and its tenants would be required to meet all Federal, State, and local air quality requirements.

2. Procurement of Ozone Depleting Substances

The CAA, as amended in 1990, established a deadline of 2000 for phasing out production of the Class I Ozone Depleting Substances (ODS), chlorofluorocarbons (CFCs), halons, and carbon tetrachloride, and 2002 for methyl chloroform. In 1992, these deadlines were accelerated in response to scientific findings that significant ozone depletion is underway in the Northern Hemisphere. The accelerated schedule required the phase out of Class I ODSs by December 31, 1995. Also in 1992, the United States and other parties to the Montreal Protocol agreed to accelerate the phase out of CFCs, carbon tetrachloride and methyl chloroform to the end of 1995 and halons to the end of 1993. Under the Montreal Protocol, the United States must also phase out its use of Class II ODSs (hydrochlorofluorocarbons or HCFCs) by 2030. The purchase of these ODSs is no longer allowed and should not be an air quality impact under the proposed ISRP action.

3. *Manufacturing, Processing, Storing, or Handling Regulated Substances.*

The CAA, Section 112(r), places a general duty on the owners and operators of stationary sources producing, processing, handling, or storing any extremely hazardous substance, or any substance listed pursuant to Section 112(r) to: 1) identify hazards that may result from accidental releases; 2) design and maintain a safe facility; and 3) minimize the consequences of releases.

Risk Management Plan (RMP) refers to 40 CFR 68, "Chemical Accident Prevention Provisions". This section states that companies that manufacture, process, store, or handle regulated substances in amounts greater than threshold quantities are required to comply with these regulations by June 21, 1999. All decisions relating to this activity are based on the EPA List of Regulated Flammable Substances and List of Regulated Toxic Substances and their corresponding threshold quantities. In addition, facilities must be aware of the General Duty Clause of the CAA, which addresses all hazardous substances, regardless of the threshold amount. All processes at the ISRP that include hazardous chemicals, regardless of the quantity or applicability to the RMP List Rule, would be subject to the general duty clause of the RMP rule. EPA has delegated authority to the State of Florida Department of Community Affairs to administer the RMP regulations. Because of the nature of the proposed ISRP action and the restriction of proposed ISRP land uses to R&D, technology development, minimal commercialization activities, and the risk of manufacturing, processing, storing, or handling regulated substances would be considered minimal.

4.2.3 Cumulative Impacts

This section considers the impacts on the environment, which would result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR §1508.7). The cumulative projects being considered under this analysis are listed in Chapter 2.

Regarding development contemplated in the NASA long term planning documents, given the speculative nature of these plans, it is difficult to quantify the effects the implementation of the plan would have on KSC and the surrounding environs. However, the Cape Canaveral Spaceport Master Plan addressed three planning horizons; 30 years, 50 years and 75 years. Given the expected build out of 20 years for the ISRP, it is appropriate to address the expected effects of the 30-year planning horizon of this plan.

1. *Increased Traffic from ISRP Occupants at Build-Out*

One of the most influential air quality fluctuations on a routine basis is created by the emissions from automobiles entering and departing KSC each day. Operation of the ISRP will be associated with an increase in traffic. At completion of the ISRP, the worst-case scenario (Futron 2002) estimates 7,000 more vehicles will be in use each day from employees working at the ISRP. Brevard County is currently in attainment with the standards for ozone. Mobile sources and the control of the emissions from vehicles are regulated under Title II of the Clean Air Act (CAA). Based on current regulations and best available predictions of traffic affiliated with the ISRP action, the increased traffic will have a significant impact to the air quality.

The potential impacts from the increased traffic, that may be associated with the development of the ISRP, would have the greatest impact to the air quality within the area surrounding KSC. The effects of traffic on air quality were calculated using AP-42: Compilation of Air Pollutant Emission Factors, Volume II, Table 1.1A.1 (USEPA 2000). Emissions were calculated for vehicles assumed: to be driven 64 km (40 mi) roundtrip per day, to have been driven 80,450 km (50,000 mi), and to be 5-years old from the date in question (Table 4-2). Results show a consistent increase in hydrocarbons (HC 33.42 percent), carbon monoxide (CO 46.67 percent), and nitrogen oxides (NO_x 32.78 percent) emissions because of the increased traffic associated with the proposed build-out of the ISRP by 2020 (Table 4-3). Therefore, the proposed increase in the number of vehicles on KSC would have a significant negative impact on air quality, particularly an increase in the carbon monoxide (CO) emissions.

Changes in air quality that may occur from the proposed development of the ISRP are not expected to have a significant negative impact on Brevard County or regional air quality (Tables 4-2 and 4-3). Historically, during the NASA Apollo Program, the pollutants within vehicle emissions were very high. Comparing 2020 air quality estimates for Brevard County (increase in HC by 18.26 percent, CO by 30.00 percent, and NO_x by 17.69 percent) to historical air quality estimated from the 1970s (decrease in HC by 5.67 percent, CO by 8.91 percent, and NO_x by 14.65 percent), the slight increase in predicted air pollutants associated with the development of the ISRP would not cause a significant negative impact to the air quality of the region. Therefore, the air quality in Brevard County would not be substantially impacted due to the development of the ISRP and the development of the ISRP would not cause non-attainment for the region.

Table 4-2. Emissions from Automobiles at KSC and in Brevard County, including vehicles associated with the ISRP.

KSC	Cars per Employee	Total Cars ⁴	Vehicle Km (Miles) Traveled (VMT) ²	Emissions kg/day (lbs/day) ³		
				HC	CO	NO _x
Past (1970)	1	25,895	1,666,602 (1,035,800)	8,441 (18,611)	92,726 (204,423)	3,563 (7,855)
Current (2000)	1	15,000	965,400 (600,000)	358 (791)	5,632 (12,417)	392 (866)
Future (2020) ¹	1	22,000	1,415,920 (880,000)	478 (1,055)	8,260 (18,211)	521 (1,150)
Brevard County	Cars per House ⁵	Total Cars	Vehicle Km (Miles) Traveled (VMT) ²	Emissions kg/day (lbs/day) ³		
				HC	CO	NO _x
Past (1970)	1	95,723	6,160,714 (3,828,909)	31,206 (68,797)	342,769 (755,665)	13,171 (29,038)
Current (2000)	2	396,390	25,511,660 (15,855,600)	9,481 (20,903)	148,838 (328,128)	10,385 (22,896)
Future (2020) ¹	2	515,307	33,165,158 (20,612,280)	11,213 (24,721)	193,490 (426,567)	12,223 (26,947)

¹ Based on 30% increase in 2000 population.

² Based on 40 miles per car per day roundtrip.

³ USEPA 2000. Emissions are based on Table 1.1A.1. Emissions (pounds per day) were based on a 5-year old vehicle with 50,000 miles.

⁴ Based on the total number of employees.

⁵ Based on 2000 US Census Information.

Table 4-3. Estimated Changes in Emissions associated with the proposed ISRP at KSC and within Brevard County.

KSC	Emissions					
	HC		CO		NO _x	
Change from	kg/day (lbs/day)	Percent	kg/day (lbs/day)	Percent	kg/day (lbs/day)	Percent
2000 to 2020	119 (264)	33.42	2628 (5,795)	46.67	128 (284)	32.78
1970 to 2020	-7963 (-17,556)	-5.67	84,465 (-186,212)	-8.91	-3,041 (-6,705)	-14.65

Brevard County	Emissions					
	HC		CO		NO _x	
Change from	kg/day (lbs/day)	Percent	kg/day (lbs/day)	Percent	kg/day (lbs/day)	Percent
2000 to 2020	1731 (3,817)	18.26	44651 (98,439)	30.00	1,837 (4,051)	17.69
1970 to 2020	-19992 (-44,076)	-35.93	-149,278 (-329,098)	-56.45	-948 (-2,091)	-92.80

Many of the estimates shown in Table 4-2 and 4-3 include the effects address in the Cape Canaveral Spaceport Master Plan for planning horizon 1. The Master plan also predicts an additional increase resulting from increased tourist activities and increased population in the KSC Industrial Area. These increases amount to some 10 to 15% over the estimates shown in the above tables. Therefore, it is safe to say that for planning horizon 1 the cumulative effects of full build out under this scenario would produce significant impacts to local air quality.

4.2.4 Impacts and Mitigation Measures

This section summarizes significant impacts identified in Section 4.2.2 and proposes potential mitigation measures or identifies regulatory authority required for each identified impact. The impacts are referenced by the section, "ATM" for atmospheric environment, followed by a number in consecutive order. The impacts presented are applicable for Alternative 1 (Phases A-E), Alternative 2 (Phases A-E), and the Phase F parcel.

Impact ATM-1. Construction activity would generate PM and PM10 that could significantly impact the quality of the air within the local region.

Mitigation Measure to ATM-1. FDEP regulatory guidance indicates that the most effective way to evaluate construction-generated air quality impacts is to emphasize implementation of effective and comprehensive control measures rather than detailed quantification of construction PM emissions. The potential emissions for unconfined PM in general come from, but are not restricted to, removal of vegetative cover, vehicular movement, transportation of materials, demolition, modification, and construction projects within KSC. The following are reasonable precautions to control unconfined emissions of PM: restricted speed limit on unpaved roads to prevent excess emission of PM, application of water as needed during construction activities to control excessive airborne PM, providing enclosure or canopy covering for material stockpiling and transportation whenever possible and practical, and confine or enclose, whenever practical, those activities which may cause airborne PM. PM10 emissions related to the production of dust during the construction phase of this project would also be minimized by the implementation of mitigation measures and this would also prevent dust clouds from impacting sensitive receptors such as residences. As long as the dust production is minimized by these suppression measures, the PM and PM10 emissions would be well below the significance level of 5 tons per year and would have a negligible air quality impact.

Impact ATM-2. The use of controlled burns without air curtains, to dispose of ground cover and construction debris from land clearing activities would violate regulations pursuant of Rules 62-256, F.A.C.

Mitigation Measures for ATM-2. Open burning regulations are contained in Chapter 62-256, F.A.C. The FDEP and the Florida Department of Forestry are the primary agencies regulating open burning at KSC and on MINWR. Impacts from controlled burns that use an air curtain incinerator are considered insignificant. Chapter 62-256 F.A.C. authorizes only air curtain incinerators to be used in controlled burns of ground cover and construction debris, which are permitted by the County of Brevard. If the air curtain incinerator is properly used as prescribed in F.A.C. 62-256, the air emissions would remain minimal with no significant impacts.

Impact ATM-3: The increase in the number of vehicles that would be associated with the proposed development of the ISRP would potentially have a significant negative impact on air quality at KSC, but would not have a significant negative impact through Brevard County and the remaining study region.

Mitigation Measure to ATM-3: Because the potential significant decrease in air quality is estimated to be a local impact to KSC and there is no justification or need to develop a regional mass transport systems plan, NASA and FSA would encourage the use of the Brevard County sponsored commuter van pool systems and other public transportation systems such as SCAT. As a part of the NASA and the FSA educational outreach activities, NASA would provide educational information on the value of reducing traffic and improving air quality within KSC. These outreach activities could, for example, be part of the KSC Environmental Awareness Week. Title II of the CAA regulates vehicle fuels and new vehicle emission standards. Few, if any, direct mitigating actions are available or within the control of NASA or FSA.

4.3 AMBIENT NOISE

This section describes the environmental consequences of noise within KSC, the ISRP alternative sites, and the nearby surrounding area.

4.3.1 Standards of Significance

An alternative for the ISRP EIS would have a significant impact on ambient noise if it would:

- Produce threshold volumes that exceeded 70dBA for a 24-hour period (EPA/ONAC 550/9-74-004, March, 1974)
- Violate local noise ordinances under the Noise Control Act of 1972.

4.3.2 Impacts Discussion

Construction and operation of the proposed ISRP would generate noise that may be elevated as compared to ambient noise. Audiometric measures taken at similarly scaled sites suggest boundary noise level measurements will not exceed tolerable threshold limits of 70 dBA for a 24-hour timeframe (NASA 2002). The No Action Alternative would have no impact on ambient noise. Ambient noise at the Alternative 1 (Phases A-F) site may be slightly greater than ambient noise within the Alternative 2 (Phases A-F) site, due to the citrus agriculture activity within the area and the proximity of Space Commerce Way to the site. For the purpose of characterizing

the environmental consequences of noise related to the proposed ISRP development, impacts related to noise would be the same for both action alternatives.

4.3.3 Construction-Related Impacts

Ambient noise levels are expected to increase during construction activities and daily operations as a result of the development of the ISRP on Alternative 1 (Phases A-F) or Alternative 2 (Phases A-F). Noise generated by construction vehicles is expected to be below all noise thresholds and would occur over a brief period of time. EPA's recommended upper level noise threshold is 70 dBA, for a 24-hour timeframe (NASA 1997,EPA 1974). Noise within the site during any specific construction period will be intermittently higher depending on the specific construction activities occurring. Noise levels higher than 55 dBA can impact speech and provide an annoyance factor to the people in the area. However, no impacts to hearing in individuals or populations either within or outside the ISRP would be expected to occur. Impacts to noise receptors due to construction of the ISRP at either site are expected to be minimal. Potential noise impacts to the wildlife at each alternative are discussed in Section 4.6, Biological Resources. Noise levels would not violate local noise ordinances.

4.3.4 Operation-Related Impacts

Following completion of the ISRP, nuisance noise levels for the planned industrial/light-industrial operations are not expected to exceed ambient 45 dBA to 55 dBA (measured on A-weighted scale) as measured at boundary lines and compared with similar industrial settings (NASA 2002). Noise levels would not violate local noise ordinances.

4.3.5 Cumulative Impacts

The cumulative impacts of increased noise within KSC, as a result of the ISRP development and other actions associated with the 30 year planning horizon, would not result in a significant cumulative impact. The effects of localized noise on animal species is discussed in Section 4.6 Biological Resources.

4.4 **GEOLOGY AND SOILS**

This section describes the environmental consequences of the proposed ISRP development as related to the geology and soils within KSC, the ISRP alternative sites, and the nearby surrounding area.

4.4.1 Standards of Significance

An alternative for the ISRP EIS would have a significant impact on geology and soils if it would:

- Significantly alter the lithology, stratigraphy, and geological structure that controls groundwater quality, distribution of aquifers and confining beds, and groundwater availability.
- Significantly change the soil composition, structure or function within the environment.
- Significantly expose levels of soil contamination that would pose a human health risk and subsequently require environmental remediation.

4.4.2 Impacts Discussion

Development of the proposed ISRP at either of the action alternatives would not significantly impact the local geology of KSC. Potential impacts to the surface and shallow soils within each site are discussed in the following sections.

4.4.21 No Action Alternative

The No Action Alternative would have no impacts on geology and.

4.4.2.2 Alternative 1

The construction of the proposed ISRP on Alternative 1 (Phases A-E) and development of the Phase F parcel would result in impacts to the shallow, medium to fine grain sands of the Pleistocene and Miocene deposits. Land clearing and site preparation activities would cause disturbance in the upper soil layers and may result in changes in the subsurface flow of water from rainfall events. These activities would not be considered significant because most of the site has had previous widespread soils disturbance over much of the area due to agriculture.

Because of the generally low flat topography of 0.03 to 0.91 m (0.1 to 3.0 ft) National Geodetic Vertical Datum (NGVD), fill would be required to increase road and building elevations to 1.8 to 2.3 m (6.0 and 7.5 ft), respectively. A minimum amount of grading would be needed because the site has been previously graded for the citrus groves. Increasing soil depth in some region would cause compaction and potentially alter soil moistures and infiltration rates; however, these impacts are considered unavoidable. Mitigation for alterations of surface water hydrology is discussed in Section 4.5 Hydrology and Surface Water.

Soils within the Alternative 1 (Phases A-F) site have been exposed to chemicals such as pesticides and fertilizers that have been used in the citrus groves during the past 100 years. Citrus agriculture practices have occurred on the site since around 1885 (ACI 2003; Appendix I). Soil samples within and nearby the Alternative 1 (Phases A-F) site were tested as part of a KSC baseline soil composition study (Schmalzer *et al.* 2000). Results from one of two the soil test (sample number SSC163) conducted on Alternative 1 (Phases A-E) indicate slightly elevated levels of vanadium (18 mg/Kg) as compared to the Human Health Risk-Based Soil Screen Criteria for KSC (15 mg/Kg)(Appendix G1. Tables G-1 and G-2). Results of the soil sampling conducted near Phase F (sample number SSC165) indicate levels of copper (110 mg/Kg) equal to the Human Health Risk-Based Soil Screen Criteria for KSC (110 mg/Kg)(Appendix G1. Table G-1 and G-2). A Phase 1 survey following American Society for Testing and Materials (ASTM) procedures will be conducted on these sites and the results provided in the Final Environmental Impact Statement; however, results to date do not indicate significant levels of soil contamination within Alternative 1 (Phases A-F) that would require remediation.

Operation of the proposed ISRP would not impact the geology or soils.

4.4.2.3 Alternative 2

Soils disturbances caused by construction activity would impact the upper soil layers on the Alternative 2 (Phases A-E) site. Land clearing and site preparation would cause significant impacts to the Pomello and Immokalee sands that characterize the uplands within the site. Grading would be required to reduce the existing topography, which ranges from 0.9 to 3.0 m (3.0 to 10.0 ft). Minimal soil disturbance has previously occurred on this site. Fill would be

required within areas of low elevations. Estimates for finished floor and paved parking elevation range from 2.0 to 3.1 m (6.5 to 10 ft) NGVD (Dynamac 2003). Impacts to the Phase F parcel are similar to the impacts to Alternative 1 (Phases A-E). These impacts are discussed in Section 4.4.2.2.

Soils within the Alternative 2 (Phases A-E) site do not appear to have been impacted by human activity that would have resulted in contamination. Soil samples within and nearby the Alternative 2 (Phases A-E) site were tested as part of a KSC baseline soil composition study (Schmalzer *et al.* 2000). Results from four soil test sampling locations (sample numbers SSC025, SSC026, SSC101, SSC102) indicate all tested chemical parameters were below detection limits (Appendix G1. Table G-1 and G-2). Results of the soil sampling conducted near Phase F (sample number SSC165) indicate levels of copper (110 mg/Kg) equal to the Human Health Risk-Based Soil Screen Criteria for KSC (110 mg/Kg)(Appendix G1. Table G-1 and G-2). A Phase 1 survey following American Society for Testing and Materials (ASTM) procedures will be conducted on these sites and the results provided in the Final Environmental Impact Statement; however, results to date do not indicate significant levels of soil contamination within Alternative 2 (Phases A-F) that would require remediation.

Operation of the proposed ISRP would not impact the geology or soils.

4.4.3 Impacts and Mitigation Measures

This section summarizes significant impacts identified in Section 4.4 and proposes potential mitigation measures. The impacts are referenced by the section, "GEO" for geography and soils, followed by a number in consecutive order.

Applicable to: Alternative 2 (Phases A-E)

Impact GEO-1: Construction of the proposed ISRP would change the soil composition, structure, and function within the specific initial construction and development site due to the construction activities of moving and adding soils to the site.

Mitigation Measures for GEO-1. The impacts will be limited only to the development site and will not adversely affect the adjacent land. These impacts are unavoidable and cannot be mitigated.

4.4.4 Cumulative Impacts

This section considers the impacts on the environment, which would result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR §1508.7). The cumulative projects being considered under this analysis are listed in Chapter 2 Section 2.2 Baseline Conditions.

Regarding development contemplated in the NASA long term planning documents, given the speculative nature of these plans, it is difficult to quantify the effects the implementation of the plan would have on KSC and the surrounding environs. However, the Cape Canaveral Spaceport Master Plan addressed three planning horizons; 30 years, 50 years and 75 years. Given the expected build out of 20 years for the ISRP, it is appropriate to address the expected effects of the 30-year planning horizon of this plan.

As the impacts to geology and soils from all contemplated actions within the 30-year planning horizon would most likely occur in either the ISRP or the KSC Industrial Area, they will fall within areas already slated for development and not effect adjacent lands. These cumulative effects then are very localized and are considered unavoidable.

4.5 HYDROLOGY AND WATER QUALITY

This section describes site-specific and cumulative impacts to hydrology and water quality resulting from the construction and operation of the ISRP at the alternative sites. The No Action Alternative would have no site-specific impacts.

4.5.1 Standards of Significance

Development of the ISRP would be determined to have a significant impact, considering both the context and intensity of the action (40 CFR §1508.27), on hydrology and water quality at the alternative development sites and surrounding region of influence if it:

- Reduced surface water quality on site or within the surrounding surface waters.
- Caused flooding or the undesired retention of surface water on site or nearby.
- Significantly reduced recharge to the surficial aquifers.
- Significantly increased evapotranspiration rates or water use requirements as a result of hydrological alterations.
- Introduced pollutants via hydrological processes into the surficial aquifers.
- Resulted in a violation of a law, code or ordinance regulating the surface water, groundwater, stormwater or other aspects of general hydrology or water quality.

4.5.2 Impacts Discussion

Construction of the ISRP at either of the proposed alternative sites would be conducted following best engineering practices to minimize hydrologic and water quality impacts onsite and to surrounding areas of KSC and MINWR. Stormwater management plans, that included stormwater modeling, have been developed with conceptual land use plans to determine site design at the proposed two alternate sites. The stormwater analyses were conducted to determine the amount of land necessary to provide adequate treatment and storage capacity, for both pre- and post-developed conditions (JEA 2002, Dynamac 2003).

Stormwater modeling results aided in establishing approximate finished floor elevations above the 100-year storm zone, determining approximate fill requirements, sizing of major road culverts, pond control structure elevations, and elevations and surface areas of proposed ponds. The stormwater management systems proposed for the alternative sites would be constructed in phases as parcels are developed. Even with these practices, local impacts to hydrology and water quality occur with construction and operations of facilities. These site-specific impacts are summarized in Table 4-4.

Table 4-4. General Site-Specific Impacts to Hydrology and Water Quality Associated with Construction and Operations of Roads and Facilities at the Proposed ISRP

Activity	Impact
Vegetation Clearing	Alters local evapotranspiration processes, exposes soil

Activity	Impact
	to wind and rain erosion (turbidity), reduces storage, increases runoff potential, alters surficial aquifer recharge rates.
Soil Disturbance	Alters runoff, storage, and infiltration rates. Increases turbidity potential.
Grading	Alters runoff, storage, and infiltration rates. Increases turbidity potential.
Impervious Surfaces	Alters runoff, storage, and infiltration rates. Alters local evapotranspiration processes. Reduces local surficial aquifer recharge.
Landscaping	Alters local evapotranspiration processes, runoff, storage, and infiltration rates. Use of fertilizers and pesticides.
Irrigation	Alters local evapotranspiration processes, runoff, storage, and infiltration rates. Impacts to surficial aquifer.
Stormwater Conveyance	Alters local evapotranspiration processes, runoff, storage, and infiltration rates. Impacts to surficial aquifer
Retention Ponds	Alters local evapotranspiration processes runoff, storage, and infiltration rates. Impacts to surficial aquifer
Vehicle Use	Increased loading of pollutants associated with parking lots, roads, tires, fossil fuel combustion (NO ₂ , CO, CO ₂ , grease and oil, polycyclic hydrocarbons, metals)

Surface water discharges from the selected site would be managed according to requirements of the SJRWMD conditions for issuance of Environmental Resource Permits. The SJRWMD *Applicants Handbook for Management and Storage of Surface Waters* Chapter 10.3 states:

- The post-development peak rate of discharge must not exceed the pre-development peak rate of discharge.
- The peak discharge requirement shall be met for the 25-year frequency storm. In determining the peak rate of discharge, a 24-hour duration storm is to be used.

In addition, the SJRWMD requires wet detention systems to be designed in a manner that discharges meet applicable water quality standards in SJRWMD Rules 40C-42.026(4).

Water quality impacts to the Outstanding Florida Waters associated with the IRL and MINWR would be minimized by the design, operation, and maintenance of a stormwater management system that would meet or exceed all requirements of the SJRWMD. In addition, because the system would be built in phases, modifications to design can be made to address any issues or concerns that may arise as ISRP development continues over time.

Background surface water quality sampling sites (conducted as a part of the KSC baseline survey Schmalzer *et al.* 2000) located nearby the alternative development sites were evaluated for indications of surface water contamination. Results from the four sampling locations (two near Alternative 1 (Phases A-F) and two near Alternative 2 (Phases A-E); Appendix G1. Table G-4) indicate that all chemical parameters tested were below the Human Health Risk-Based

Surface Water Screen Criteria for KSC (Appendix G1. Table G-3). A Phase 1 survey following American Society for Testing and Materials (ASTM) procedures will be conducted on these sites and provided in the Final Environmental Impact Statement; however, results to date do not indicate significant levels of surface water contamination that would require remediation at either of the proposed alternatives.

4.5.2.1 No Action Alternative

The No Action Alternative would have no site-specific impacts. Hydrologic conditions and surface waters associated with Alternative 1 (Phases A-F) and Alternative 2 (Phases A-F) would remain in their current condition.

4.5.2.2 Alternative 1 (Phases A-F)

Surface waters on Alternative 1 (Phases A-E) include 2.9 ha (7.1 ac) of upland ditches, and a dredged reservoir system with an area of 1.9 ha (4.8 ac) for a total of 4.8 ha (11.8 ac). These ditches and ponds were initially developed for managing water levels in the citrus areas and as a source of fill materials for road construction and for filling low areas in the vicinity. There are no surface waters associated with the Phase F parcel.

a. Construction-Related Impacts

1. *Alteration of Surface Water or Ground Water Quality.*

Many construction activities can significantly impact surface water quality by increasing run-off potential. Vegetation clearing, soil disturbance, and grading of the landscape can reduce the quality of the surface water. Exposed soils increase turbidity of water running off of the land into surface waters or wetland systems. The lack of vegetation can cause nutrients, which are typically used by plants, to flow directly into surface water bodies. Best Management Practices (BMP) would be used during all construction activity to minimize impacts to surface water. Other mitigation for surface water quality impacts are discussed in relationship to wetlands in Section 4.6 Biological Resources.

2. *Change of Surface Water Flow Patterns.*

Clearing and grading in the existing citrus management ditches and wetlands areas would result in local impacts to surface waters flow patterns. Construction of stormwater conveyance and retention systems would increase the area and volume of surface waters on site to 8.5 ha (21 ac) to fulfill stormwater management requirements (JEA 2002). These systems would alter and expand the existing drainage network and reservoir system allowing for better management and control of stormwater. Wetland mitigation (see Section 4.6 Biological Resources) and a stormwater system would be required to compensate for impacts to surface water flow patterns.

3. *Alteration of Local Evapotranspiration Rate and Infiltration Rates.*

Clearing and grading may also result in local impacts to infiltration rates, discharge rates, and evapotranspiration rates. Removal of vegetation and the construction of approximately 74 ha (182 ac) of impervious surface would have a direct impact on the local hydrology and surface water systems. Loss of surface water infiltration beneath impervious areas and

evapotranspiration from vegetation cover would occur over approximately 57 percent of the site. These impacts would potentially reduce soil moisture levels, reduce surficial aquifer water levels, and increase site evapotranspiration rates. These changes would directly alter the thermal and hydrologic budgets of the site with potential influences on microclimate, as well as surface and groundwater volumes and chemistry.

b. Operation-Related Impacts

1. *Alteration of Surface Water or Groundwater Quality.*

Site maintenance activities including irrigation, fertilizing, and pest management would have no additional significant negative impacts on the site that was previously managed as citrus groves. Approximately 78 percent and 77 percent, respectively, of Alternative 1 (Phases A-E) and the Phase F parcel were previously cleared and graded for planting citrus groves. Citrus agriculture practices have occurred on the site since around 1885 (ACI 2003; Appendix I). Development of the stormwater management system may improve the surface and ground water quality on Alternative 1 (Phases A-F).

4.5.2.3 Alternative 2 (Phases A-F)

Surface water areas on Alternative 2 (Phases A-E) include a shallow 1.7 ha (4.2 ac) borrow area located along northern boundary and an upland-cut ditch along southern site boundary. The ditch, which was created as the result of extracting fill material to build the road, averages 1.2 m (4 ft) wide and 1.5 m (5 ft) deep with steep side slopes. In addition, ephemeral surface waters are frequently associated with the numerous high quality wetlands on the site. No surface waters are associated with the Phase F parcel.

a. Construction-Related Impacts

1. *Alteration of Surface Water or Ground Water Quality.*

Impacts to hydrology and surface waters associated with vegetation clearing, soil disturbance, and grading at this site (Table 4-4) are considered significant. Minimal soil disturbance has occurred on this site, which is dominated by native scrub vegetation and wetland systems. Construction would potentially reduce surface water quality in the wetland systems. The stormwater management system would be designed to retain run-off from developments within Alternative 2 (Phases A-E), reducing water quality impacts. Mitigation for impacts to surface water systems is addressed under wetland mitigation in Section 4.6 Biological Resources.

2. *Change of Surface Water Flow Patterns.*

The surface water flows through swale marsh systems dispersed across the entire landscape of the Alternative 2 (Phases A-E) site. Construction in this landscape would significantly alter the natural surface water flow patterns. A stormwater drainage and retention system would be constructed increasing the area and volume of surface water on site to 8.5 ha (21 ac) to fulfill storm water management requirements (Dynamac 2003). The stormwater management system design would compensate for impacts to surface water flow patterns on Alternative 2 (see Section 4.6 Biological Resources).

3. *Alteration of Local Evapotranspiration Rate and Infiltration Rates.*

Alternative 2 (Phases A-E) has abundant natural communities and undisturbed soils that are associated with primary surficial aquifer recharge on KSC. Clearing and grading would result in local impacts to hydrology, the surficial aquifer, and surface waters through alteration of flow patterns, infiltration rates, discharge rates, and evapotranspiration rates. Construction of 54.2 ha (134 ac) of impervious surface would have direct significant impacts on the local hydrologic cycle and surface water systems. Loss of surface water infiltration beneath impervious areas and evapotranspiration from vegetation cover over approximately 42 percent of the site would alter soil moisture levels, surficial aquifer water levels, and site evapotranspiration rates. These changes would directly alter the thermal and hydrologic budgets of the site with potential influences on microclimate, vegetation communities, wetland systems, as well as surface and groundwater volumes and chemistry. Extensive mitigation is planned for these impacts (Section 4.6 Biological Resources).

b. Operation-Related Impacts

Site maintenance and the impact of vehicle traffic are the two major sources of operations-related impacts to hydrology and surface waters on Alternative 2 (Phases A-F). Site maintenance activities including irrigation, fertilizing, and management would have significant negative impacts on surface and groundwater of the site that was previously managed as wildlife habitat for federally protected species. These activities would result in loadings of nitrogen, phosphorous, and potassium, as well as herbicides and pesticides. Vehicle traffic would add pollutants such as PAH, grease, oil, and metals to surface water and groundwater through atmospheric deposition processes and runoff from roads and impervious surfaces (Table 4-4).

4.5.3 Cumulative Impacts

This section considers the cumulative impacts on the environment that result from the incremental impact of the action when added to other past, present and foreseeable future projects. Chapter 2 Section 2.2 Baseline Conditions presents the cumulative projects. Regarding development contemplated in the NASA long term planning documents, given the speculative nature of these plans, it is difficult to quantify the effects the implementation of the plan would have on KSC and the surrounding environs. However, the Cape Canaveral Spaceport Master Plan addressed three planning horizons; 30 years, 50 years and 75 years. Given the expected build out of 20 years for the ISRP, it is appropriate to address the expected effects of the 30-year planning horizon of this plan.

Increased vehicle traffic has the potential to add pollutants to surface water and groundwater through atmospheric deposition processes and runoff from roads and impervious surfaces (Table 4-4). Other sources of pollutants include fossil fuel combustion. Vehicles associated with the construction and operation of the proposed ISRP would not significantly increase pollutants in surface water or ground water. Baseline conditions of the surface water and surficial aquifer have been studied recently in some detail (Schmalzer et al. 2000, Schmalzer and Hensley 2001). Results of the chemical analysis of shallow, intermediate and deep well data (well number DS-4; Appendix G1. Table G-6) near Alternative 2 indicate that widespread contamination of the surficial aquifer on KSC has not occurred.

Most trace metals were in low concentrations in KSC groundwater, if they occurred above detection levels. Aluminum (Al), iron (Fe), and manganese (Mn) occurred above detection limits

more frequently than other trace metals (well number DS-4; Appendix G1. Tables G-5 and G-6). Al and Fe are abundant components in the Earth's crust and are present in KSC soils. Intense leaching, particularly in acid scrub and flatwoods soils, mobilizes Al and Fe (Paton et al. 1995). Iron is a typical constituent of groundwater in the surficial aquifer in Florida (Miller 1997). Manganese is one of the most abundant trace elements (Kabata-Pendias and Pendias 1984); it is present in KSC soils but the concentrations are relatively low. Solution and precipitation of Fe and Mn are affected by pH and oxidation-reduction conditions.

Construction of the proposed ISRP and additional projects within the KSC Industrial Area would increase the percentage of impervious surface area within its watershed. This increase in impervious surface area can decrease surficial aquifer recharge. Because a large proportion of the "Prime Recharge" and "Good Recharge" areas of KSC remain undeveloped (or lack extensive impervious surfaces) the cumulative effects of reduced surficial aquifer recharge would not be significant.

Low impact BMPs would be implemented in the design and development of the ISRP and projects within the KSC Industrial Area so that significant cumulative impacts are unlikely. Modern stormwater management system designs would reduce pollutant loading into sensitive surface water regions like the Indian River or the Banana River. NASA currently conducts water quality monitoring of surface water and groundwater throughout KSC. This long-term monitoring would identify potential pollutant loading problems that may occur as a result of cumulative development on KSC. No significant cumulative impacts related to hydrology or water quality have been identified.

4.5.4 Impacts and Mitigation Measures

This section summarizes significant impacts identified in Section 4.5.2, and proposes potential mitigation measures or identifies regulatory authorization required for each identified impact. The impacts are referred to by the section "HYD" for hydrology and water quality, followed by a number in consecutive order. The alternative site for which it is applicable is defined under each impact.

Applicable to: Alternative 1 (Phases A-E), Alternative 2 (Phases A-E), and Phase F

Impact HYD-1: Construction and operation of the ISRP may alter surface water quality or hydrological processes, including impacts to Class II and III Waters. Hydrological processes and water quality are regulated by the Florida Water Resources Act 1972 (Part IV of Chapter 373, F.S. and Chapter 62-40, F.A.C.) and Section 404 of the Clean Water Act.

Mitigation Measures HYD-1: A Wetland Mitigation Plan would be required to address impacts related to wetland systems within the alternative sites. The ERP addresses issues of water quality and general hydrology. Water quality monitoring may also be required as mitigation to the proposed impacts. Low impact BMPs would be implemented in the design and development of the ISRP.

Applicable to: Alternative 2 (Phases A-E)

Impact HYD-2: Construction and operation of the ISRP would change surface water flow patterns.

Mitigation Measures HYD-2: A Wetland Mitigation Plan that includes a Stormwater Management System would be required to address impacts related to surface water flow. The Environmental Resources Permit addresses issues related to the alteration of natural hydrological flow patterns.

Applicable to: Alternative 1(Phases A-E), Alternative 2(Phases A-E), and Phase F

Impact HYD-3: Construction and operation of the ISRP would increase local evapotranspiration rates and reduce infiltration rates.

Mitigation Measures HYD-3: The ERP that would be required for construction of the proposed ISRP would address issues related to the alteration of local evapotranspiration rates and reduced infiltration rates. The required wetland mitigation and Stormwater Management System would significantly reduce these hydrological impacts.

Applicable to: Alternative 1(Phases A-E), Alternative 2(Phases A-E), and Phase F

4.6 BIOLOGICAL RESOURCES

This section analyzes direct, indirect, and cumulative effects on biological resources expected to result from construction and operation of the alternatives for the ISRP at KSC, including the No Action Alternative.

A Biological Assessment (BA), prepared in accordance with 16 USC §1536 (c), is provided in Appendix B. A Biological Opinion (BO) was issued by the USFWS on June 11, 2003, and is also included in Appendix B. The BA and BO provide a detailed analysis of the effects of ISRP development action on federally listed fauna and flora occurring or potentially occurring on the Alternative 1 (Phases A-F) and Alternative 2 (Phases A-F) sites.

4.6.1 Standards of Significance

Development of the ISRP would be determined to have a significant impact, considering both the context and intensity of the action (40 CFR §1508.27), on biological resources at the alternative development sites and surrounding region of influence if it would:

- Substantially reduce the number or restrict the range of federally or State-listed plant or animal species.
- Substantially impact or alter, over time, important habitat of federally or State-listed plant or animal species. This includes, but is not limited to, degradation of habitat quality due to changes in drainage or fire patterns, proliferation of exotic plant species, or introduction of contaminants from construction and operation activities.
- Substantially interfere with important behaviors, including, but not limited to, dispersal, reproduction, and foraging of federally or State-listed plant or animal species.
- Substantially disturb natural communities (e.g., wetlands, scrub).
- Result in a violation of a law, code, or ordinance protecting or regulating federally or State-listed plant or animal species.

4.6.2 Impacts Discussion

This section analyzes potential impacts from construction and operation of the ISRP from each of the three alternatives on potentially affected resources identified in Chapter 3. The resources are terrestrial, wetland, and aquatic habitats, and endangered and threatened animal and plant species. This section is organized by the impact, and not the resource, recognizing that the disruption or elimination of a terrestrial, wetland, or aquatic habitat negatively influences the critical linkages that provide essential elements for species survival. Table 4-5 provides a summary of the total direct impacts to terrestrial, wetland, and aquatic habitat types resulting from development of the ISRP for each alternative site. No significant impacts are expected under the No Action Alternative. Under the No Action Alternative the citrus groves located on Alternative 1(Phases A-E) and Phase F, would remain under lease to the Kerr Foundation through 2008. Once the lease expired, the citrus groves would be abandoned and the land would be managed by the USFWS as part of the MINWR. USFWS has discussed long-term plans for habitat restoration of the Alternative 1 (Phases A-E) and Phase F sites. The habitat on Alternative 2 (Phases A-E) would continue to be managed by USFWS as part of the MINWR.

Table 4-5. Summary of Impacts to Habitat Types Proposed for Development on the ISRP Alternative Sites

FLUCCS Classification Code	Classification Description	Impact Area (ha)	Impact Area (ac)
Alternative 1 (Phases A-F)			
2211	Citrus Grove	107.3	265.2
4140	Pine-Mesic Oak	1.8	4.5
5100	Upland Ditch	3.0	7.3
6170	Mixed Wetland Hardwoods	0.5 ¹	1.1 ¹
6190	Exotic Wetlands	4.6	11.4
6410	Freshwater Marsh	0.6	1.5
TOTALS		117.8	291.0
Alternative 2 (Phases A-F)			
2211	Citrus Grove	7.6	18.8
4111	Scrubby Pine Flatwood	49.6	122.5
4140	Pine-Mesic Oak	1.8	4.5
4210	Oak Scrub	20.8	51.3
5340	Reservoirs<10ac	1.5	3.7
6170	Mixed Wetland Hardwoods	0.5 ¹	1.1 ¹
6410	Freshwater Marsh	1.4	3.6
7400	Disturbed Scrubby Flatwoods	3.1	7.6
8145	Unpaved and Drained Roads	0.5	1.3
TOTALS		86.8	214.4
¹ Isolated wetland located on Phase F parcel. FLUCCS - Florida Land Use Cover and Forms Classification System (FDOT 1999)			

Table 4-6 identifies 16 Federal and State-listed species, documented or expected to be located on Alternative 1 (Phases A-E), Alternative 2 (Phases A-E), or the Phase F parcel. The Table also identifies the potential for significant impacts from the ISRP development action categorized for review by alternative sites. This determination is based on the stated standards of significance.

4.6.2.1 No Action Alternative

Under the No Action Alternative, no new development would occur on either of the Alternative 1 (Phases A-F) or Alternative 2 (Phases A-F) sites. Current land uses in these areas would remain unchanged relative to the baseline. Any existing indirect impacts on biological resources would continue under the No Action Alternative. There would be no direct or indirect impacts to biological resources under this alternative.

Table 4-6. State and Federal Listed Species with Potential for Significant Impacts from ISRP Development by Alternative Site.

SCIENTIFIC NAME	COMMON NAME	STATUS OF PROTECTION		ALT. 1	Phase F	ALT. 2
Amphibians and Reptiles		STATE	FEDERAL			
<i>Alligator mississippiensis</i>	American alligator	SSC	T(S/A)			
<i>Drymarchon corais couperi</i>	Eastern indigo snake	T	T	X	X	X
<i>Gopherus polyphemus</i>	Gopher tortoise	SSC				X
<i>Rana capito aesopus</i>	Florida gopher frog	SSC				X
<i>Pituophis melanoleucus mugitus</i>	Florida pine snake	SSC				X
Birds						
<i>Ajaia ajaja</i>	Roseate spoonbill	SSC				
<i>Aphelocoma coerulescens</i>	Florida Scrub-jay	T	T			X
<i>Egretta caerulea</i>	Little blue heron	SSC				
<i>Egretta rufescens</i>	Reddish egret	SSC				
<i>Egretta thula</i>	Snowy egret	SSC				
<i>Egretta tricolor</i>	Tricolored heron	SSC				
<i>Eudocimus albus</i>	White ibis	SSC				
<i>Falco sparverius paulus</i>	Southeastern American kestrel	T				
<i>Haliaeetus leucocephalus</i>	Bald eagle	T	T			X
<i>Mycteria americana</i>	Wood stork	E	E			
Mammals						
<i>Podomys floridanus</i>	Florida mouse	SSC				X
	TOTALS	16	4	1	1	7
SSC = Species of Special Concern; T(S/A) = Threatened/ Similarity of Appearance; T = Threatened; E = Endangered						

4.6.2.2 Alternative 1 (Phases A-F)

The proposed land use plan for Alternative 1 (Phases A-F) is shown in Figure 2-1. The potential for significant direct and indirect impacts on biological resources from construction and operation of the proposed ISRP on the Alternative 1 (Phases A-E) and Phase F sites is minimized due to several contributing baseline and development design factors:

1. The persistent negative influence from the citrus groves limits the availability of suitable habitat for use by a wide range of listed and non-listed species. Two federally listed and nine State-listed species were determined to potentially occur on sites under this alternative (Table 3-12). The use of the Alternative 1 (Phases A-F) site by seven of these species, including the federally listed wood stork and State-listed alligator and five wading bird species, would be limited to opportunistic feeding within artificially created and locally common ditches and reservoir habitat types. The availability of essential feeding habitats for these species is moderate to high. Additionally, each species is recognized to have high opportunities for dispersal (Breininger *et al.* 1994) to more attractive, higher quality habitat.
2. Natural processes have been substantially interrupted on both development sites under this alternative. Specifically, drainage patterns have been severely altered. Exotic plant species have proliferated within drained wetlands embedded within the citrus groves and along the edges of wetland and upland hammocks. Species movement patterns have been altered due to the open habitat structure of the citrus groves and periodic presence of humans for grove maintenance. Mesopredator populations have increased in the disturbed habitats. Contaminants, especially fertilizers and pesticides required for citrus production have been released into the aquatic systems. Historically, fire was probably not a major influencing factor in maintaining habitat quality on this site, as the site was likely dominated by hydric hammock habitat that rarely burned.
3. The proposed Land Use Plan (JEA 2002) for this preferred alternative was designed to concentrate development disturbances to those habitat areas that have already been altered (citrus groves) and degraded (Brazilian pepper infested wetlands) or are artificially created and locally common (ditches). The plan avoids and minimizes impacts to the more functionally intact habitats (hardwood hammock wetlands). Disturbed habitats comprise almost 98 percent of the total proposed land impacted under this alternative. A total of approximately 18 ha (45 ac) of minimally disturbed hardwood hammock wetlands are proposed to be preserved. This design measure serves to reduce the severity of potential direct, indirect, and cumulative effects of the proposed development action on potentially affected animal and plant species.
4. The proposed phased development approach of the ISRP initially minimizes the direct effects of widespread habitat loss by limiting the duration and extent of construction disturbances. However, over time these short-term events would be additive resulting in permanent alteration of most of the existing habitat on the Alternative 1 (Phases A-E) site and the Phase F parcel.

The BA determined that significant indirect and cumulative effects of habitat fragmentation caused by the proposed action are likely, over time, to result in a “take”, as prohibited by Section 9 of the ESA and defined in Section 3 (18) of the ESA, for the federally listed eastern indigo snake from increased risks due to road mortality. No other Federal or State-listed species would be significantly impacted by development of the ISRP under this alternative (Table 4-6). The USFWS BO concurred with the BA and approved “take” of the eastern indigo snake, and no affect to other species.

a. Construction-Related Impacts

1. *Loss of Habitat, including Filling of Jurisdictional Wetlands and Surface Waters*

Development of the ISRP on the Alternative 1 (Phases A-F) would cause, at complete build-out projected over a 20-year time frame, the direct loss of approximately 117.8 ha (291 ac) or 86 percent of the existing habitat (Table 4-5). Terrestrial resources that would be impacted include all the Citrus Groves (FLUCCS-2211) and the Pine-Mesic Oak (FLUCCS-4140) area comprising a total of 107.3 ha (265.2 ac). Wetland resources that would be impacted include approximately 4.6 ha (11.4 ac) of low quality Exotic Wetlands (FLUCCS-6190) and 0.5 ha (1.1ac) of medium quality Mixed Wetland Hardwoods (FLUCCS-6170) on the Phase F (JEA 2002) parcel. Aquatic resources that would be altered by filling are the upland-cut agricultural ditches (FLUCCS-5100) to facilitate construction of the master stormwater system. The direct loss of habitat from development of the proposed ISRP is a permanent, unavoidable adverse impact.

The impacts to wildlife associated with the loss of citrus groves and low-quality wetlands would be minimal. Natural functional attributes of these areas were lost nearly a century ago (ACI 2003). The disturbed wetlands that would be filled for ISRP development are currently infested by the exotic pest plant, Brazilian pepper. These disturbed areas are not recognized as common habitats of protected plants documented to occur on KSC (Schmalzer *et al.* 2002). However, the impact associated with the additive loss of 117.8 ha (291 ac) of disturbed upland and wetland habitat, in the long-term, would be considered potentially significant primarily due to the indirect and cumulative effects of habitat fragmentation on the federally listed eastern indigo snake.

2. *Short-term Modification of Species Behavior due to Construction-Related Noise*

The intensity of the short-term impacts on species behavior due to construction-related noise would be negligible under this alternative because of the disturbed baseline condition of the sites and current periodic presence of equipment and human-related activities associated with cultivation and harvest of citrus. Many species are sensitive to human activity and would move away from the disturbance resulting in a temporary shift in location of individuals or groups. The phased approach to construction and the preservation of the 16.9 ha (41.8 ac) wetland hammock located along the western boundary of Alternative 1 (Phases A-E) would provide a forested corridor for movement through the site. This reduces short-term construction impacts to wide-ranging species, such as the eastern indigo snake. This impact would be considered less than significant because of these baseline and development design factors.

3. *Impacts to Jurisdictional Wetlands from Construction Runoff*

The potential for adverse direct and indirect impacts to preserved wetlands from construction runoff causing decreased water quality or altering wetland hydroperiods would be minimized by implementing reasonable and prudent measures discussed below in Section 4.6.4. Implementation of construction measures that follow State standards would mitigate potential impacts and result in no significant impacts.

4. *Construction-Related Mortality or Human Harassment*

The direct effects associated with construction, including the potential for individual mortality from construction equipment or harassment from encounters with humans, are expected to be no different than current conditions (citrus maintenance) on the sites. This potential impact would not be considered significant with implementation of reasonable and prudent measures directed at minimizing this impact on the federally protected eastern indigo snake, as discussed below in Section 4.6.4.

b. *Operation-Related Impacts*

1. *Habitat Fragmentation from Habitat Loss and Road Development*

Habitat fragmentation would lead to indirect effects on wildlife species over time. Fragmentation would occur due to permanent habitat loss and road construction. Closely linked would be the impacts associated with increases in human growth and traffic induced by ISRP development.

The indirect effect of permanent habitat loss and road construction would be fragmentation of the contiguous landscape where the Alternative 1 (Phases A-E) site is located. Roads are one of the main causes of land fragmentation and thus a major reason for decline and isolation of many wildlife species (Moler 1992, Hartmann 2002). Increased human growth and traffic would compound the adverse effects of habitat fragmentation and have the greatest potential to result in significant impacts to wildlife species occurring under this alternative. The federally listed eastern indigo snake is highly susceptible to road mortality and human harassment because of its wide-ranging spatial needs, low mobility, and diurnal behavior patterns (Moler 1992, R. Smith unpublished data). At build-out, a total of 4.5 km (2.8 mi) of roads would be constructed to serve the 8,000 to 10,000 anticipated employees at the ISRP. Research at KSC has found distinct avoidance patterns by indigo snakes when roadways intersect a home range (NASA 2000). Roadways effectively change survival behavior (dispersal, foraging, reproduction, etc.).

The indirect effects of habitat fragmentation, presence of multiple roads, and increased human presence potentially resulting from implementation of the ISRP under this alternative were determined in the BA and BO (Appendix B) as “likely to adversely affect” the eastern indigo snake. The potential for the proposed action to result in “take” of the eastern indigo snake in the form of “harm” was considered significant. Harm is defined as an act that actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns including breeding, feeding or sheltering (50 CFR §17.3). The USFWS BO approved “take” of the eastern indigo snake.

The impact of habitat fragmentation and roads under this alternative on Federal and State-listed wading birds and the southeastern American kestrel would not be considered significant. This is determined by local abundance of the disturbed or artificial habitats being used and high opportunity for these species to disperse.

2. *Habitat Availability and Disruption of Natural Processes*

Operation-related impacts on habitat availability and natural processes were considered based on the availability of suitable feeding and breeding habitat within species dispersal range, degradation of habitat quality from changes in drainage and fire patterns, or associated risks related to forced dispersal.

A total of approximately 18 ha (45 ac) of wetland habitat types would be preserved under the Alternative 1 (Phases A-F) proposed land use plan. These areas would include 100 percent of the high quality (Wetland Forest Mixed, FLUCCS-6300) wetland hammock habitat occurring along the western boundary of the Alternative 1 (Phases A-E) site (Figure 2-1). Conservation of this wetland hammock in post-development conditions would serve to reduce both direct and indirect impacts associated with habitat loss on animal and plant species under this alternative. Wetland hammocks provide excellent feeding habitat and potential den sites to eastern indigo snakes (R. Smith pers. comm.). Hammocks also provide important habitat to birds of prey, including the red-shouldered hawk (*Buteo lineatus*), Cooper's hawk (*Accipiter cooperii*), barred owl (*Strix varia*) and possibly black vulture (*Coragyps atratus*) and turkey vulture (*Cathartes aura*). They may occasionally be important to many migrating warblers and other neotropical migrants (Breininger *et al.* 1994). River otters (*Lutra canadensis*) and bobcats (*Lynx rufus*) use hammocks on KSC for cover and movement throughout their large home ranges (Gosselink and Lee 1989, Breininger *et al.* 1994). Importantly, the hammock is part of a contiguous landscape that extends westward, with minimal fragmenting barriers, from Alternative 1 (Phases A-F) site to the Indian River Lagoon, and would thereby serve to provide a potential corridor for species movement around the proposed ISRP development. Conservation of the wetland hammock also serves to maintain potential habitat for 16 endangered and threatened plants (Schmalzer *et al.* 2002). The preservation of 18 ha (45 ac) of wetlands would be considered to have the potential for significant beneficial effects.

Listed wading birds predicted to periodically feed within existing ditches and reservoirs on the Alternative 1 (Phases A-E) site have a high availability of essential feeding habitats on KSC and the surrounding region and a high opportunity to disperse to alternative feeding sites. The Phase F parcel does not contain these artificial aquatic habitat types. Therefore, operation-related impacts would not be considered significant to listed wading birds.

Development of the complete master stormwater system would result in the creation of a total of 13.4 ha (33.2 ac) of open surface water habitats to augment the existing 1.9 ha (4.8 ac) of Reservoirs (FLUCCS-5340) proposed for integration into the stormwater system. The creation of surface water habitat to provide stormwater management would be implemented as part of each construction phase. This approach would serve to compensate for the loss of existing artificial feeding areas for wading birds, over time. At build-out, the stormwater management system would consist of a total of 15.3 ha (38 ac) of open water habitats, the edges of which would provide suitable feeding habitat to wood storks. The potential that environmental contaminants within the proposed stormwater management system may negatively influence these species over time is not considered to be significant as compared to baseline exposure levels within ditches and impoundments.

Under Alternative 1 (Phases A-F) further disruption of natural processes from degraded baseline conditions is not expected. Risks associated with potentially affected species dispersal would be primarily limited to increased road mortality and harassment by humans as discussed above and would not be considered significant.

3. Boundary Effects

Consideration of boundary effects includes the consideration of long-term modification of species behavior; isolation of species or populations; introduction of exotic plant species and mesopredators; changes in habitat structure along boundaries; and introduction of road contaminants into wetlands.

With the exception of the adverse effects of habitat fragmentation discussed above, a substantial increase in negative boundary effects would not be expected relative to the current

degraded conditions. Exotic plant species have already substantially degraded many of the wetland habitats under Alternative 1 (Phases A-F). In fact, a reduction in exotic plant species within the preserved hardwood wetland habitats is recommended under the wetland mitigation measures proposed (as discussed in Section 4.6.4). This habitat enhancement action would be expected to benefit all native species whether listed or non-listed, associated with wetland hammock habitats.

4. *Effects of Operational Noise and Lighting*

Consideration of the effects of operational noise and lighting includes consideration of the potential for long-term modification of behavior of wildlife species.

Many mammals, amphibians, and some bird species are active at night, with proposed operational noise and lighting potentially disrupting their movements, breeding, or other behaviors. Operational lighting and noise may alter the dispersal pattern of bobcats and feeding patterns of resident owl species. The availability and cover afforded by preserved wetland hammock would provide a suitable dispersal corridor and foraging habitat to these species. No significant impacts to listed species considered under this alternative as a result of operational noise and lighting are expected, as these species are characterized by diurnal behavior patterns, including the eastern indigo snake which is completely diurnal (Moler 1992).

5. *Effects of Increased Stormwater Runoff from Impermeable Surfaces on Sensitive Habitats and Loss of Native Upland Habitat Adjacent to Wetlands*

As discussed above, development of the master stormwater system under Alternative 1 (Phases A-F) would result, at build-out, in the creation of a total of 13.4 ha (33.2 ac) of open surface water habitats. The primary function of this system is to capture stormwater runoff from impervious surfaces of development containing oils, greases, and contaminants detaining it for a sufficient period to prevent flooding and allow for physical, chemical, and biological processes to enhance water quality prior to ultimate discharge into the Indian River Lagoon. No direct stormwater discharges into the preserved wetland hammock systems are proposed; therefore, no significant impacts to this sensitive wetland habitat would be expected.

Impacts associated with the loss of native upland habitat adjacent to preserved wetlands is not considered significant relative to baseline conditions which have already caused adverse edge effects, such as the proliferation of exotic pest plants and changes in the microclimate of the hammock along the edges. Management of the wetlands to be preserved under this alternative, over time, is expected to result in enhanced habitat quality from removal of exotic plants.

6. *Loss of Foraging Habitat for Raptors*

Citrus groves under Alternative 1 (Phases A-F) were identified to provide potential foraging habitat to the State-listed southeastern American kestrel. Development of this disturbed habitat is not expected to significantly impact this species or other resident or migratory raptors considering citrus groves are locally abundant.

Bald eagles, known to nest within 2.8 km (1.7 mi) of the Alternative 1 (Phase A-E) site, rarely use disturbed habitats, such as citrus groves, for feeding. Bald eagles frequently feed in locally abundant ditches and canals (Breininger *et al.* 1994). Potential impacts to bald eagles from ISRP development under this alternative would not be considered significant.

4.6.2.3 Alternative 2 (Phases A-F)

The proposed Land Use Plan for Alternative 2 (Phases A-E) (Dynamac 2003), not including the Phase F parcel, is provided in Figure 2-2. The impacts of ISRP development on biological resources of the Phase F parcel are discussed in Section 4.6.2.2 Alternative 1 (Phases A-F) and are not repeated in this section. Therefore, the following impact discussion is limited to the potentially affected biological resources of the Alternative 2 (Phases A-E) site located east of Kennedy Parkway South (SR 3). Although the types of impacts expected by implementation of the ISRP action on Alternative 2 (Phases A-F) are similar to those described for the Alternative 1 (Phases A-F), under Alternative 2 (Phases A-F) the majority of direct and indirect effects on biological resources would be significant. This determination is based on the following factors:

1. Alternative 2 (Phases A-E) includes habitats that are considered vital for continuation of three federally listed species and four State-listed animal species on KSC (Breininger *et al.* 1994); the Florida Scrub-jay, eastern indigo snake, bald eagle, gopher tortoise and its burrow commensals the Florida gopher frog, Florida mouse, and Florida pine snake. The significance of this impact is intensified by the fact that each of these species, except the bald eagle, has biological characteristics that result in low opportunities for successful dispersal (Breininger *et al.* 1994).
2. Alternative 2 (Phases A-E) lies within an optimal quality landscape exhibiting high habitat heterogeneity; few fragmenting barriers are present and natural processes of fire and surface and groundwater hydrology are intact. Fires have been frequent across the scrub and pine flatwoods landscape (Breininger *et al.* 2001) and wetland surface hydrology appears undisturbed, with the exception of disturbances caused by ditches and firebreak construction. The presence of exotic plant species is minimal and primarily limited to the disturbed edges along B Avenue SW (Tel-4 Road) and the disturbed scrubby flatwoods area in the northwest corner of the site. Mesopredator populations appear to be limited due to the dominance of high quality native habitats.
3. The Alternative 2 (Phases A-E) site contains 96 ha (237.3 ac) of regionally important scrub and scrubby pine flatwoods habitat. This habitat type is required or used by more priority species than any other terrestrial habitat on KSC (Breininger *et al.* 1994). It also contains locally and regionally rare swale marshes, some of which support significant populations of Curtiss reedgrass, listed as threatened by the State of Florida due to its global and local rarity. Review of Table 3-12 shows that nine additional State-listed plants are potentially associated with scrub and flatwoods or swale marsh habitats on Alternative 2 (Phases A-E).
4. Direct, indirect, and cumulative effects of development of the ISRP action on the Alternative 2 (Phases A-E) site have been determined to have a high potential to result in the take of two federally listed species, the Florida Scrub-jay and eastern indigo snake. The proposed action also has the potential to result in the take of four State-listed species, the gopher tortoise and protected commensal species, such as the Florida gopher frog, Florida pine snake, and Florida mouse. The “taking” of State-listed species is a prohibited action (Rule 68A-27.003-005, F.A.C.), except as authorized by a species-specific permit.

a. Construction-Related Impacts

Each of the construction-related impacts caused by ISRP development on biological resources identified under Alternative 2 (Phases A-E) would be considered significant under this alternative. Federally and State-listed species predicted to be substantially impacted by construction-related actions under Alternative 2 (Phases A-E) are: Florida Scrub-jay, eastern indigo snake, bald eagle, gopher tortoise and listed burrow commensals.

The proposed land use plan for Alternative 2 (Phases A-E), exclusive of the Phase F parcel (Figure 2-2), would cause, at complete build-out projected over a 20-year time frame, the loss of approximately 76.3 ha (188.7 ac) of existing habitat. This comprises 59 percent of the total habitat on Alternative 2 (Table 4-5). Upland habitat types that would be impacted include 97 percent of the Oak Scrub (FLUCCS-4210), 66 percent of the scrubby flatwoods (FLUCCS-4111), and 92 percent of the disturbed Scrubby Flatwoods (FLUCCS-7400) on the Alternative 2 site. Approximately 1.4 ha (3.6 ac) of high quality jurisdictional Freshwater Marsh (FLUCCS-6410) and 1.5 ha (3.7 ac) of Reservoir (FLUCCS-5340) impacts would occur under Alternative 2. It would be considered a significant direct impact due to the potential for substantial reduction in the number of federally and State-listed animal and plant species known or expected to occur within the affected habitats.

The land use plan proposed in Alternative 2 (Phases A-F) would not impact approximately 19.4 ha (48 ac) of upland habitat located within the designated conservation area and 6.9 ha (17.1 ac) of upland habitat contained within the 25 ft (7.6 m) buffers surrounding each preserved wetland. Approximately 21.4 ha (52.9 ac) or 94 percent of the Freshwater Marshes (FLUCCS-6410) and 100 percent of the Mixed Wetland Hardwood (FLUCCS-6170) would also be maintained under the proposed Alternative 2 (Phases A-F) Land Use Plan (Dynamac 2003). Development of the master stormwater system would result in the creation of a total of 8.5 ha (21.0 ac) of open surface water habitat, including the integration of the existing reservoir located along the Alternative 2 (Phase A-E) north boundary into the stormwater system.

The BA (Appendix B) determined that implementation of the proposed ISRP action on the Alternative 2 (Phases A-E) site would cause the direct loss of 73.4 ha (181.4 ac) of occupied Scrub-jay habitat resulting in the “take”, in the form of “harm”, of a minimum of eight Florida Scrub-jay territories. Based on the long-term research of this local population by Breininger and Oddy (2001), the majority of the territories that would be impacted under this alternative are likely sources to the local KSC Scrub-jay population. The Tel-4 population is the only population on KSC that is not in decline and is known to be actually increasing and the proposed ISRP development on the Alternative 2 (Phases A-E) site has the potential to jeopardize core recovery efforts of this species at KSC (D. Breininger email– 2/7/03). Development would not precede on Alternative 2 without preparation of a new BA, formal consultation with the USFWS, and procurement of a BO and an Incidental Take Statement from the USFWS under the terms of Sections 7 (a)(2) and 7) (b)(4) of the ESA. This potential impact would be considered significant.

The direct loss of 73.4 ha (181.4 ac) of upland habitat types, all of which is considered suitable gopher tortoise habitat, has the potential to impact 125 to 206 individual gopher tortoises. This estimate is based on preliminary gopher tortoise density estimates (Section 3.6.1.1.3). Given the high density of gopher tortoises and the optimal suitability of the habitat, the potential that the proposed action would also adversely impact State-listed burrow commensals, such as the eastern indigo snake, Florida gopher frog, Florida mouse, and Florida pine snake is high. The eastern indigo snake and the Florida gopher frog have been documented in the vicinity of the Alternative 2 (Phase A-E) site. Development could not proceed on the Alternative 2 (Phase A-E) site until a permit, pursuant to the requirements of Rules 68A-25.002, F.A.C. and 68A-27.005, F.A.C, is secured authorizing the incidental take or relocation of gopher tortoises, including any encountered State-listed commensals. Development would not precede on Alternative 2 (Phases A-E) without preparation of a new BA, formal consultation with the USFWS, and procurement of a BO and an Incidental Take Statement for the eastern indigo snake from the USFWS under the terms of Sections 7 (a)2 and 7 (b)4 of the ESA. This potential impact would be considered significant.

Impacts to 1.4 ha (3.6 ac) of high quality jurisdictional freshwater swale marshes would directly impact important breeding habitat of the Florida gopher frog and important foraging habitat of

both the eastern indigo snake and gopher tortoise (Breininger *et al.* 1994). Direct impacts to jurisdictional wetlands would also result in the loss of the rare Curtiss reedgrass. This potential impact would be considered significant.

Noise generated by construction equipment at Alternative 2 (Phases A-F) is expected to temporarily affect the behavior of the majority of wildlife species, including all listed species potentially using this undisturbed site. Baseline noise generated at this site is low and mainly limited to noise generated by traffic on Kennedy Parkway South and the infrequently traveled B Ave SW (Tel-4 Road). Construction-related noise impacts would be considered potentially significant because of the minimal disturbances currently occurring there and the expected high species occurrence on the site.

Two active bald eagle nests are located within 1.6 km (1 mi) of the Alternative 2 (Phase A-E) site (MINWR and FWC unpublished 2002 data). The tolerance of individual eagle pairs to human disturbance, defined as a change in eagle behavior that is induced by human activity (Fraser *et al.* 1985) or habitat alteration, varies widely (USFWS 2002). In order to evaluate the actual response of the subject eagles to construction-related noise and operation-related lighting disturbances, the BA recommends implementation of a monitoring program, conducted in accordance with Bald Eagle Monitoring Guidelines (USFWS 2002), for any development activities occurring within 1 km (0.6 mi) of a bald eagle nest tree. Until the actual response is established, this construction-related impact would be considered significant.

Reasonable and prudent measures, as discussed below in Section 4.6.4, would be implemented during construction to minimize the discharge of construction runoff or dewatering operations into preserved wetlands. However, due to the pristine condition of the subject swale marshes and presence of the State-listed Curtiss reedgrass, any potential discharges of construction runoff into this sensitive wetland community would be considered significant.

The potential for significant impacts from construction vehicles inadvertently injuring or killing wildlife, including a listed species, under this alternative would be considered high. This consideration is based on the predicted abundance of wildlife occurring on this optimal quality site and low dispersal characteristics of the eastern indigo snake, gopher tortoise, Florida gopher frog, Florida mouse, and Florida pine snake.

b. Operation-Related Impacts

The analysis of the effects of ISRP operation-related impacts on biological resources under Alternative 2 (Phases A-E) is summarized below. Most of the operation-related impacts would be considered significant under Alternative 2 (Phases A-E).

The long-term adverse effects of habitat fragmentation, include, but are not limited to, potential faunal collapse, invasion of exotic plants and mesopredators, and alteration or disruption of ecosystem processes. Habitat loss and insularization would result in a significant impact. The broad effects of habitat fragmentation would be expected to contribute to a substantial decline in biological diversity as compared to baseline conditions on Alternative 2 (Phases A-E). The negative effects of habitat fragmentation on Florida Scrub-jays are well documented (Fitzpatrick *et al.* 1994, Thaxton and Hingtgen 1996, Breininger 1999, Breininger *et al.* 1994, 1996b, 2001). The substantial loss of important scrub and pine flatwoods habitat and multiple families of Florida Scrub-jays would be expected to extend beyond the borders of the Alternative 2 development site, adversely affecting the regionally important Tel-4 Florida Scrub-jay population (D. Breininger email – 2/7/03).

The proposed construction of 4.7 km (2.9 mi) of interior access roads would be expected to have a significant negative influence on the local Tel-4 Florida Scrub-jay population, immediately and over time, although the low speed limits may reduce the number of vehicular collisions. Additionally, noise associated with construction and operation of roads is greater along edges altering critical behaviors (mating, foraging, resting) and influences predator detection and prey location (Brown *et al.* 1990, Breininger *et al.* 1994).

The effects of habitat fragmentation on wide-ranging species, in particular the federally listed eastern indigo snake, would be considered significant as discussed above under the Alternative 1 (Phases A-F). The number of individual indigo snakes potentially at risk under Alternative 2 (Phases A-F) is expected to be greater than under Alternative 1 (Phases A-F) due primarily to the optimal landscape for indigo snakes in which the Alternative 2 (Phases A-E) site is embedded.

Remnant populations of gopher tortoise and listed commensals that may remain within the proposed 34.7 ha (85.7 ac) conservation area, under post-development conditions, would be almost totally surrounded by roads, thus placing dispersing individuals at high risk for road mortality. The isolating effects of the roads would be intensified by the low mobility of each of the affected species. The larger populations would be at increased risk of local extinction.

Fragmentation may adversely influence processes and productivity in wetlands. The primary direct impacts to jurisdictional wetlands under Alternative 2 (Phases A-E) would be from road crossings. Road crossing designs can influence the impacts on surrounding wetlands. For example, road crossings that are designed with restricted flows could potentially act as a dam in the system, causing adverse changes in the wetland hydroperiod. This indirect effect would likely cause a reduction in species diversity and shifts in species composition and dominance (Darnell, 1976). Once native wetland plants are stressed, due to a disturbance in the flood frequencies, the potential for successful colonization by exotic plants increases (Mitsch and Gosselink, 1993). Melaleuca and Brazilian pepper, both highly invasive exotic species, are now sparsely scattered within the Alternative 2 (Phases A-E) wetlands proposed for preservation. These exotic species are likely to proliferate, if hydrological impacts to wetlands occur under Alternative 2 (Phases A-E) and even if wetland area is preserved under the Alternative 2 (Phase A-F) land use plan.

Fire exclusion in scrub and pine flatwoods habitat is a major cause of habitat degradation for critically dependent species: the Florida Scrub-jay, eastern indigo snake, bald eagle, gopher tortoise and State-listed commensals. Fire is also required to maintain the dominant herbaceous species composition of the swale marshes. Curtiss reedgrass is thriving under the current fire regime. The ability to properly manage the fire-dependent habitats remaining on the Alternative 2 site and those in the surrounding landscape would likely be constrained by ISRP operations on the Alternative 2 (Phases A-E) site. The lack of ability to manage the fire maintained natural communities would be considered a significant indirect impact, because of the potential to substantially alter important habitat for those listed species identified above and result in additional population declines.

Two bald eagle nests are documented within 1.6 km (1 mi) of the Alternative 2 (Phases A-E) site. The long-term impacts of operation noise and lighting under Alternative 2 were determined in the BA to have the potential to cause bald eagles to forego nesting and perhaps completely abandon the nest site. The majority of the bald eagle nest sites on KSC are located approximately 1.5 km (0.9 mi) from occupied buildings, which may indicate individual intolerance for operational noise, lighting, and human presence. As stated above individual tolerance for disturbance varies and monitoring of the eagle's response to the proposed action would be recommended. Until the actual response is established, the indirect and cumulative

effects of operation noise, lighting and human presence on this listed species is considered significant.

Bald eagles can also be victims of vehicular collisions when feeding on carrion along roadways (Hardesty and Collopy 1991, Breininger *et al.* 1994). However, the slow speed limits to be applied to the interior access roads proposed for Alternative 2 and large size of this species should minimize the potential significance of this impact.

Bald eagles are critically dependent on scrub and pine flatwoods habitat for breeding and nesting, however they rarely use such habitat for feeding. The swale marshes occurring on the Alternative 2 (Phases A-E) site in the scrub and pine flatwoods habitat are a common foraging habitat of bald eagles (Breininger *et al.* 1994). The loss of scrub and pine flatwood habitat proposed under Alternative 2 (Phases A-E) is not expected to have significant direct impacts on this species, however the indirect and cumulative effects of ISRP development under Alternative 2 (Phases A-F) have the potential to become significant unless compensation is implemented.

The open habitat structure of the scrub and pine flatwoods/swale marsh landscape of Alternative 2 (Phases A-E) provides optimal foraging and nesting opportunities to the State-listed southeastern American kestrel. Breininger *et al.* (1994) documented that the southeastern American kestrel is vulnerable to local extinction based on wide-ranging (area-dependent) habitats, low fecundity, dependence on a fire-maintained habitat, and habitat specialization of a kind prone to human disturbance. Development actions under Alternative 2 (Phases A-E) have the potential to contribute to population decline of this rare species because of the optimal suitability of the habitat that would be converted or degraded.

The impact of the proposed action on listed wading birds expected to periodically feed in the swale marshes would not be considered substantial. This consideration results from the fact that the majority of the marshes would be maintained under Alternative 2 (Phases A-E), the species are very mobile, and the local availability of essential feeding habitat is high.

The use of the Alternative 2 (Phases A-F) site by wood storks and the American alligator is predicted to be limited to upland cut ditch and reservoir areas. Development impacts to these artificial habitats would be minimal under Alternative 2 (Phases A-F). Due to the high opportunity for dispersal by these species and local abundance of these commonly used feeding habitats, impacts resulting from the proposed action under Alternative 2 (Phases A-F) to these listed species would not be considered significant.

4.6.3 Cumulative Impacts

This section considers impacts to the environment that result from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR § 1508.7). The baseline projects considered under this analysis are listed in Chapter 2 Section 2.2 Baseline Conditions. Many of these projects would occur on existing developed or disturbed lands and would provide associated compensation or mitigation to minimize adverse cumulative effects of the action. For example, the wetland mitigation project at Space Commerce Way converted a fallow citrus grove into a beneficial wetland resource.

Regarding development contemplated in the NASA long term planning documents, given the speculative nature of these plans, it is difficult to quantify the effects the implementation of the plan would have on KSC and the surrounding environs. However, the Cape Canaveral Spaceport Master Plan addressed three planning horizons; 30 years, 50 years and 75 years. Given the expected build out of 20 years for the ISRP, it is appropriate to address the expected

effects of the 30 year planning horizon of this plan. The development projected for this horizon is mostly contained within either the ISRP or the KSC Industrial Area.

The overall zoning and land management objectives of NASA and KSC are to maintain the Nation's space mission operations while supporting alternative land uses that are in the Nation's best interest (NASA 1997). Previous development on KSC has resulted in some cumulative loss of habitat and natural resources. The baseline development that is being considered as a part of this EIS has very low potential for cumulative land use or habitat impacts since most of the baseline development would occur in previously clear areas or within the KSC Industrial Area.. KSC has developed a space program with effective resource stewardship. In keeping with these objectives, KSC has shared a common boundary with the MINWR and CNS for many years. The protection and management of the diverse and abundant biological resources on KSC has and continues to be a common goal of NASA, USFWS, and NPS. NASA consults with the USFWS/NPS on actions expected to have significant environmental impacts to identify those alternatives that would effectively minimize potential impacts. The Alternative 1 (Phases A-E) site was identified in consultation with the MINWR. The USFWS is responsible for management of citrus groves on KSC, many of which were long ago devastated by freezes and have been abandoned. Much of the groves on the northern half of Alternative 1 (Phases A-E) site and on the Phase F parcel are abandoned and infested by exotic plant species. Management of exotic species within these fallow groves is not a priority action of the USFWS, which with finite management resources is targeting exotic plants within important native habitat types. The restoration of this fallow grove area to historical hydric hammock conditions suitable for use by dependent species would be both expensive and time-consuming. The groves on the southern portion of Alternative 1 (Phases A-E) are in cultivation and are currently under lease to a private organization until 2008. When the lease expires, NASA or USFWS would accept management of the grove lands.

Past agricultural practices have had a greater negative impact on the biological resources than would occur from implementation of the proposed ISRP or the cumulative impacts of other planned activities in the vicinity. However, habitat loss and fragmentation by roads, including proposed internal access roads and the existing Space Commerce Way, and the increase in traffic and human presence as the ISRP approaches build-out, would place wide-ranging species, particularly the federally protected eastern indigo snake, at high risk of road mortality and harassment. This cumulative impact would be considered potentially significant. The initiation of two mitigation actions could serve to reduce the adverse effects of this cumulative impact: 1) launching an education program informing employees about the indigo's protected status and consequences of violating these laws, its high susceptibility to road mortality, its beneficial roles, and its general gentle disposition towards humans (Breininger *et al.* 1994), and 2) designing new roads and retrofitting, where practicable, existing roads to provide underpasses for movement between habitats. Road design and retrofitting old roads with underpasses would also be expected to benefit the wide-ranging bobcat and river otter. The use of underpasses would need to be monitored to establish effectiveness.

In contrast to impacts on Alternative 1 (Phases A-E) site, historical impacts on biological resources at the Alternative 2 (Phases A-E) site are few. The potential for the identified cumulative projects combined with the significant direct and indirect effects of the ISRP under Alternative 2 (Section 4.6.2.3) would result in highly significant impacts given the critical importance of the biological resources existing on and surrounding this site. The ability to provide adequate compensation for potential cumulative impacts would be of concern, particularly impacts on the regionally important B Ave SW (Tel-4 Rd.) Florida Scrub-jay population and the local and globally rare freshwater swale marshes, which harbor threatened populations of Curtiss reedgrass.

4.6.4 Impacts and Mitigation Measures

This section summarizes significant impacts identified in Section 4.6.2, and proposes potential mitigation measures or identifies regulatory authorization that would need to be obtained for each identified impact. The impacts are referenced by the section, “BIO” for biological resources, followed by a number in consecutive order. The alternative site for which it is applicable is defined under each impact. The Phase F parcel is defined separately in this section since many of the impacts on the main Alternative 2 (Phases A-E) site are not applicable to the Phase F parcel, although this parcel is proposed for development under Alternative 2 (Phases A-F). Mitigation Measure for Alternative 1 (Phases A-E) and the Phase F parcel were included in the BA (Appendix B) and were subsequently adopted by the USFWS in the BO.

Impact BIO-1a: Construction vehicles could inadvertently injure or kill federally listed species. Construction-related mortality is considered a potential significant impact to the eastern indigo snake due to its broad spatial needs, low mobility and diurnal behavior patterns.

Applicable to: Alternative 1 (Phases A-E), Alternative 2 (Phases A-E), and Phase F.

Mitigation Measure BIO-1a: The USFWS guidelines “Standard Protection Measures for the Eastern Indigo Snake” would be implemented to minimize the potential for construction-related mortality of this federally listed species. These guidelines, set forth in the BA (Appendix B), are directed at educating construction personnel of the protected status of this species and providing clear instructions that reduce the likelihood for intentional or accidental injury, harm, harassment, or killing of this species.

Impact BIO-1b: Construction vehicles could inadvertently injure or kill State-listed species, primarily the gopher tortoise and listed commensals associated with Alternative 2 (Phases A-E). This is considered a significant impact due to the number of individuals that could be affected and because the impact would be a violation of the Wildlife Code of the State of Florida unless species-specific permits are obtained which may include requirements for mitigation.

Applicable to: Alternative 2 (Phases A-E) only.

Mitigation Measure BIO-1b Alternative 2 (Phases A-E): A permit pursuant to Rules 68A-25.002, FAC and 68A-27.005, FAC would need to be secured from the FWC prior to the performance of any construction operations on the Alternative 2 (Phases A-E) site. Two options would be available to address potential impacts, the capture and off-site relocation of the numerous tortoises and any burrow commensals or the incidental take of these species. Considering the proposed phased approach to development, off-site relocation of the species into nearby suitable habitat not already occupied would be recommended.

Impact BIO-2: Filling of jurisdictional wetlands would eliminate existing functional attributes of these regulated habitats and result in a violation of The Florida Water Resources Act of 1972 (Part IV of Chapter 373, FS and Chapter 62-40, FAC) and Section 404 of the Federal Clean Water Act unless necessary permits are obtained and required mitigation is implemented. Mitigation in the form of wetland creation or restoration, enhancement, or preservation would be required to offset expected impacts.

Applicable to: Alternative 1 (Phases A-E), Alternative 2 (Phases A-E), and Phase F

Mitigation Measure BIO-2a Alternative 1 (Phases A-F): Wetland resources that would be impacted under this preferred alternative include approximately 4.6 ha (11.4 ac) of low quality Exotic Wetlands (FLUCCS-6190) and 0.5 ha (1.1 ac) of medium quality Mixed Wetland Hardwoods (FLUCCS-6170) on the Phase F parcel (JEA 2002). The following discussion of potential mitigation opportunities is considered conceptual and would need to be finalized as part of the Federal 404 Permit and State of Florida ERP application process. Both the USACOE and the SJRWMD have been involved in discussions regarding the proposed project and have conducted jurisdictional wetland surveys. Based on these discussions, NASA anticipates that appropriate mitigation can be carried out on KSC to offset the impacts of project implementation. The SJRWMD currently uses mitigation ratios based on the value of wetland functions to calculate required mitigation credits. The USACE currently uses the Wetlands Rapid Assessment Procedure to determine wetland mitigation requirements. For this analysis, the SJRWMD methodology was applied to determine potential wetland mitigation requirements and opportunities.

Because the value of the functions that the potentially impacted wetlands currently provide to fish and wildlife and listed species is considered to be low, the corresponding mitigation requirements would be expected to be few. Therefore, a requirement of about 12.5 mitigation credits (equivalent to 5.06 ha (12.5 ac)) would be estimated due to the extreme low quality of the impacted wetlands. This regulatory requirement may be fulfilled by creating a 2 ha (5 ac) freshwater wetland adjoining the existing 1.6 ha (4 ac) wetland created to partially address regulatory requirements associated with construction of Space Commerce Way. The remaining 7.5 mitigation credits could potentially be fulfilled through the enhancement, via removal of exotic plants, of approximately 18 ha (45 ac) of important hardwood hammock habitat on the Alternative 1 site. This is equivalent to a 6:1 ratio (acres of wetlands enhanced: acres impacted), which is within the SJRWMD ratio guidelines for wetland enhancement projects.

Mitigation Measure BIO-2b Alternative 2 (Phases A-E): The proposed Alternative 2 Land Use Plan (Dynamac 2003) achieved a high level of wetland avoidance and minimization. As a result of this design effort, only 1.4 ha (3.6 ac) of freshwater swale marshes would be directly impacted and are mainly associated with unavoidable road crossings. Due to the high quality and uniqueness of the swale marshes, considering impacts to the State protected Curtiss reedgrass, required mitigation ratios would likely be higher. A requirement of about 9 mitigation credits, based on a 2.5:1 (wetlands created: wetlands lost) is anticipated. The potential wetland mitigation proposal could also recommend the creation of the 2 ha (5 ac) freshwater wetland adjoining the existing 1.6 ha (4 ac) Space Commerce Way wetland mitigation. To fulfill remaining mitigation needs and to address potential indirect impacts of development to preserved wetlands supporting populations of Curtiss reedgrass: a commitment to a long-term comprehensive management program that would address potential impacts to this protected plant species from exotic plants and changes in hydrology could be considered. If needed the management program could be broadened to evaluate faunal concerns within the fragmented wetland preserve.

Impact BIO-3: Construction runoff into preserved wetlands could cause indirect impacts to water quality.

Applicable to: Alternative 1 (Phases A-E) and Alternative 2 (Phases A-E)

Mitigation Measure BIO-3 Alternative 1 (Phases A-E) and Alternative 2 (Phases A-E): To minimize disturbances to wetlands from this construction-related impact, construction would be avoided within the 7.6 m (25 ft) upland buffer extending from the delineated edge of preserved wetlands toward the upland. Standard BMP would be implemented to minimize runoff into these

protected areas. Dewatering into the sensitive hammock wetlands and swale marshes would be prohibited.

Impact BIO-4: Operation-related lighting along roads and in buildings within newly developed areas of Alternative 2 (Phases A-E) may impact the federally listed bald eagle by disrupting movement and breeding behaviors.

Applicable to: Alternative 2 (Phases A-E)

Mitigation Measure BIO-4 Alternative 2 (Phases A-E): A monitoring program, conducted in accordance with Bald Eagle Monitoring Guidelines (USFWS 2002), for any development activities occurring within 1 km (0.6 mi) of a bald eagle nest tree would be implemented to determine the eagle's response to these potential impacts. If significant changes in behavior were identified, then mitigation actions would be employed. For example, construction would be prohibited during the nesting season or nighttime lighting would be reduced to levels tolerated by the species.

Impact BIO-5: Development within critical Florida Scrub-jay and eastern indigo snake habitat on Alternative 2 (Phases A-E) could lead to individual mortality due to adverse direct and indirect effects of habitat displacement, including, but not limited to, predation and vehicular collisions.

Applicable to: Alternative 2 (Phases A-E)

Mitigation Measure BIO-5 Alternative 2 (Phases A-E): Development could not proceed on the Alternative 2 (Phases A-E) site without preparation of a new BA, formal consultation with the USFWS, and issuance of a BO and an Incidental Take Statement by the USFWS for covered species under the terms of Section 7(a)(2) and Section 7(b)(4) of the ESA. A scrub habitat compensation plan for proposed impacts to Florida Scrub-jay or indigo snake habitat would be completed in consultation with the Endangered Species Office of the USFWS. Based on a historically established restoration compensation ratio of 2:1, a minimum of 146.8 ha (362.8 ac) of potential Scrub-jay habitat would be required to compensate for the loss of 73.4 ha (181.4 ac) of occupied Scrub-jay habitat and a minimum of eight Scrub-jay families. This plan would be developed in consultation with the USFWS. Due to the importance of the local Scrub-jay population to the recovery of the regional KSC population, the issuance of an incidental take statement would be contingent upon a finding of "no jeopardy" by the USFWS.

Impact BIO-6: Development within critical gopher tortoise habitat on Alternative 2 (Phases A-E) could cause individual mortality of gopher tortoises and listed commensals if occupied burrows were destroyed or lead to adverse indirect effects of habitat displacement to these listed species, including, but not limited to, predation and vehicular collisions.

Applicable to: Alternative 2 (Phases A-E)

Mitigation Measure BIO-6 Alternative 2 (Phases A-E): The direct loss of 73.4 ha (181.4 ac) of upland habitat types, all of which is considered suitable gopher tortoise habitat, has the potential to impact 125 to 206 individual gopher tortoises and numerous State-listed burrow commensals, Florida gopher frog, Florida mouse, and Florida pine snake. Development could not proceed on the Alternative 2 (Phases A-E) site until a permit from FFWCC, pursuant to the requirements of Rules 68A-25.002, FAC and 68A-27.005, FAC, is secured authorizing the incidental take or relocation of gopher tortoises, including any encountered State-listed commensals. Relocation of affected species to a suitable off-site habitat is recommended during the initial phases of the ISRP project.

Impact BIO-7: Cumulative impacts of habitat fragmentation from habitat loss and introduction of new roads and increased human presence could cause the mortality or substantial harassment of numerous individual indigo snakes. Over time, this impact could negatively influence population viability.

Applicable to: Alternative 1 (Phases A-E), Alternative 2 (Phases A-E), and Phase F
Mitigation Measure BIO-7 Alternative 1 (Phases A-F) and Alternative 2 (Phases A-F): To reduce the adverse effects of this cumulative impact NASA would: 1) create an education program aimed at informing employees about the indigo's protected status and consequences of violating these laws, its high susceptibility to road mortality, its beneficial roles, and its generally gentle disposition towards humans (Breininger *et al.* 1994); 2) design new roads and retrofit, where practicable, existing roads to provide underpasses for movement between habitats; and 3) establish a monitoring program that would evaluate the effectiveness of the underpasses and address needed demographic data gaps to enable future establishment of sound conservation strategies. The second action presented would be expected to benefit other important wide-ranging wildlife.

4.7 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

This section identifies potential impacts on the population, housing, social conditions, employment, and regional economy that might result from construction and operation of the ISRP. Also evaluated are environmental justice concerns to include disproportionate impacts to low income or minority populations. Two alternative locations have been proposed along with the No Action Alternative. For the purpose of analyzing impacts to socio-economics and environmental justice, no appreciable difference exists between the Alternative 1 (Phases A-F) and Alternative 2 (Phases A-F) locations. Therefore, evaluation of these two alternatives was combined.

4.7.1 Standards of Significance

Development of the ISRP would have a significant impact with regard to the socioeconomic conditions at KSC and on the surrounding region of influence if it would:

- Create a significant detriment to the local economy;
- Significantly affect occupancy/vacancy rates in industrial, commercial, or R&D offices space;
- Create a 10 percent change in population, employment/unemployment rate, per capita income, or crime rates;
- Create a 10 percent impact on property values within Brevard County or adjacent counties;
- Create a significant impact on a local government or school district that amounts to more than 10 percent of that jurisdiction's General Fund or Revenue Limit;
- Create workers who would not be able to find housing representing over 10 percent of the predicted new households;
- Create a net negative fiscal impact on surrounding jurisdictions for support services;
- Disproportionately impact minority populations or low-income populations.

4.7.2 Impacts Discussion

4.7.2.1 Employment

4.7.2.2 No Action Alternative

The No Action Alternative would not affect employment or unemployment rates, or per capita income levels for workers in Brevard County or surrounding counties. Without the ISRP, Brevard County is projected to experience a 20 percent increase in the number of employed workers between 2000 and 2015, which is lower than the projected State growth rate. The University of Florida, Bureau of Economic and Business Research (BEBR), projects the number of employed persons to be 230,000 in Brevard County in 2015. Under the No Action Alternative, the number of KSC workers is assumed to remain stable at about 15,200 total employees.

4.7.2.3 Alternative 1 (Phases A-E), Alternative 2 (Phases A-E), and Phase F

The ISRP Development Study estimates that the number of employees working at the ISRP would be between 4,607 and 8,752 in 2016 (with a baseline projection of 6,523), before growing to as many as 10,350 employees in 2020. As noted in Section 3.7 Socioeconomics, it has been estimated that each job created within Brevard County's space industry generates an additional 1.93 jobs within the region. This yield rate is due to the many Florida industries that supply goods and services to the space program and various other NASA projects. Therefore, the number of jobs created indirectly by the ISRP would range from 8,750 to 16,600 in 2016, and as many as 19,760 in 2020 (Table 4-7).

Table 4-7. Estimation of Direct and In-Direct Job Creation from ISRP between 2004 and 2022.

<i>Estimation of Direct and In-Direct Job Creation from ISRP</i>	<i>2004</i>	<i>2006</i>	<i>2008</i>	<i>2010</i>	<i>2012</i>	<i>2014</i>	<i>2016</i>	<i>2018</i>	<i>2020</i>	<i>2022</i>
Optimistic direct employment	457	1,398	1,832	2,827	4,647	6,932	8,752	9,746	10,181	10,351
Optimistic indirect employment	868	2,656	3,480	5,371	8,829	13,170	16,629	18,517	19,344	19,667
Baseline direct employment	311	1,318	1,626	2,329	3,618	5,235	6,523	7,227	7,534	7,655
Baseline indirect employment	591	2,504	3,089	4,425	6,874	9,946	12,394	13,371	14,315	14,545
Pessimistic direct employment	225	1,249	1,448	1,902	2,733	3,776	4,607	5,061	5,259	5,337
Pessimistic indirect employment	428	2,373	2,751	3,614	5,193	7,174	8,750	9,616	9,992	10,140

Currently, 43% of Brevard County's workforce lives in the county. Assuming that a similar portion of ISRP workers would live within the county, the number of direct ISRP jobs in 2016 would represent an increase between 0.9 and 1.6 percent of Brevard County workers in 2016 compared to 1.2 percent under baseline projections. Within the six counties, considering both direct and indirect job creation, the ISRP would represent an increase of 0.8 percent to 1.5 percent above the region's projected workforce in 2016. The ISRP would, however, represent a more significant 30 percent to 58 percent increase in the KSC workforce compared to 43 percent under the baseline scenario. Under the most optimistic projections, total employment at KSC with the ISRP in 2022 would be 25,550 workers, about the same number of workers as during KSC's peak employment from 1967-1969.

4.7.3 Regional Economics

4.7.3.1 No Action Alternative

The No Action Alternative would not generate any additional impacts to the regional economy, the high-tech industry, space coast tourism, or occupancy/vacancy rates in industrial or R&D offices space in Brevard County or the surrounding counties.

4.7.3.2 Alternative 1 (Phases A-E), Alternative 2 (Phases A-E), and Phase F

Development of the ISRP would further the region's strong position as a high-tech center. The ISRP Development Study projects that the ISRP can expect to achieve full build-out at reasonable densities over a 20-year time frame, with the ISRPs period of most rapid growth between 2008 and 2014. Under the baseline forecast, the ISRP would absorb more than 195,096 m² (2.1 million ft²) of projected R&D and related space needs (Figure 4-1) and would provide Class A space not currently available in the region.

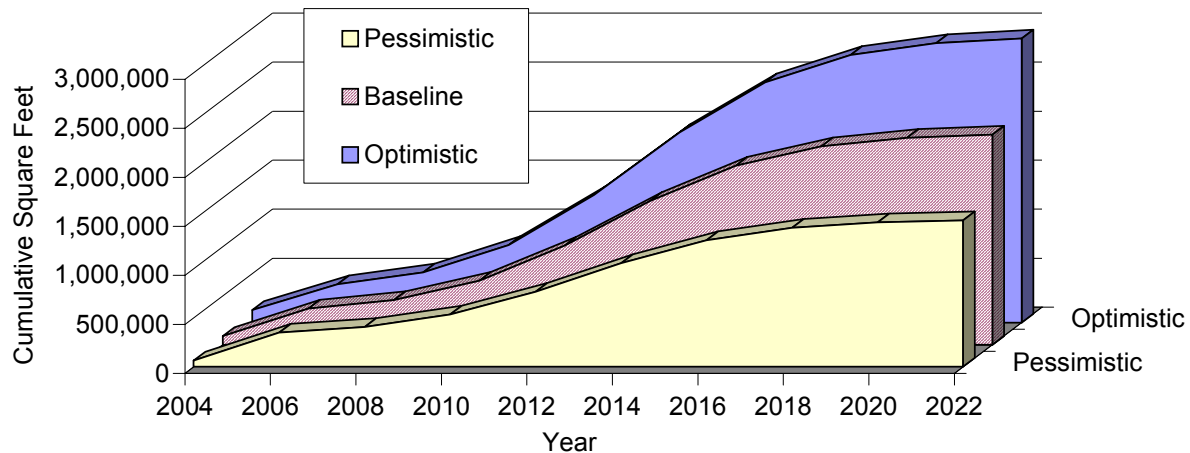


Figure 4-1. ISRP Absorption Forecasts for the Baseline, Pessimistic, and Optimistic Scenarios

The Development Study used the Regional Input-Output Modeling System II (RIMS II), developed by the U.S. Department of Commerce, to calculate the anticipated economic impacts of the ISRP on Brevard County, East Central Florida, and State of Florida. Economic impacts refer to the goods and services produced directly by ISRP activities, including computer and data processing services; engineering, architectural, and surveying services; research, development, and testing services; university education and technical training; and all other industry groups that are affected directly and indirectly by those industries. While the entire State would experience increased economic activity, higher earnings, and more jobs, Brevard County would realize the greatest share of the economic benefits that would result from ISRP construction and operations.

Economic impacts were calculated for the first 5 years of construction and for years 3, 10, and 20 of ISRP operations. Construction of roads, utilities infrastructure, and building space could bring an estimated \$70 million of additional economic activity to Brevard County and a total of about \$90 million of economic activity for the State of Florida through year five of ISRP build-out. ISRP-related construction would also create nearly 700 new jobs in Brevard County.

The demand for the final goods and services offered by ISRP tenants would generate about \$119 million of additional economic activity in 2006 or about 1 percent of Brevard County's economy. For East Central Florida and the State as a whole, ISRP activity would generate \$150 million and \$154 million in economic activity, respectively. While impressive, this number is less than 1/10th of one percent of the State's economy.

A May 2002 Development Study (Futron 2002a) for the ISRP, however, determined that existing commercial properties do not offer the same amenities or benefits associated with the planned ISRP and therefore would not directly compete for the same tenants. The closest comparable

project is the Central Florida Research Park (CFRP) adjacent to the University of Central Florida in Orlando. The CFRP has consistently ranked as one of the nation's top ten research parks and offers a strong model for the ISRP to follow. The CFRP has been in operation for about 20 years and has achieved 278,709 m² (3 million ft²) of projects employing more than 10,000 workers. However, the CFRP and ISRP are expected to have distinctly different technology magnets and market attributes, and therefore would not compete for the same new R&D dollar. Research and technology firms are likely to find one or the other park more closely aligned with their customer base and other site determination factors. The closest "Class A" space was found on the east side of Orlando, but none was found in the Titusville/Cocoa corridor.

The Vector Space Park in Titusville is the closest comparable R&D or industrial park to the ISRP, and has a number of attractive and available sites ready to be developed. Space Commerce Park, also located in Titusville, appears to have developed more companies engaged in light-to-heavy manufacturing. There are plans for a major, high-quality hotel project in Vector Space Park that have been discussed with the ISRP project team. A first-class hotel facility on the water at the gate of KSC would be viewed very positively as an amenity supporting both the Vector Space Park and ISRP.

There are many, non-class A facilities with smaller increments of m² (ft²) available within a modest travel radius of KSC, from Melbourne to Titusville. These facilities, depending on use of occupancy (office versus open floor plan) range from \$75.43 per m² (\$7.00 per ft²) to approximately \$10.76 per m² (\$12 per ft²). These may be viewed as viable alternatives only if the singular compelling reason to lease there is cost, suggesting that such tenants are not prospective targets for ISRP.

Brevard County is the majority property owner of the Spaceport Commerce Park on State Road 405 a few kilometers (miles) west of the entrance to KSC. This park includes a variety of uses including the large-scale processing activities of AstroTech, a commercial satellite payload processor. The Spaceport Commerce Park is not Class A space and its image has been somewhat compromised by disparate uses that fail to give it a unified character. As a park offering, it is a different "product type" than that envisioned for the ISRP.

The ISRP Target Market Assessment and Forecast Study (Futron 2002a) identified and interviewed organizations to gauge their interest in locating at the ISRP. The study found that organizations with sufficient space at their current facilities and located within several kilometers of KSC are unlikely to relocate to the ISRP, and therefore these organizations are not likely to compete with other commerce or industrial parks for existing tenants. For these reasons, and for the location advantages of proximity to KSC and the SERPL, the ISRP is not expected to compete directly with other area properties, but instead would provide a new class of service.

4.7.4 Population

4.7.4.1 No Action Alternative

Without the ISRP, Brevard County is projected to experience a 25 percent population growth rate between 2000 and 2015, along with an increase in per capita income of more than 31 percent. The No Action Alternative would not generate any additional impacts to the population in Brevard County or the surrounding counties.

4.7.4.2 Alternative 1 (Phases A-E), Alternative 2 (Phases A-E), and Phase F

As discussed in Section 4.7.1, the ISRP would, directly and indirectly, generate between 8,750 and 16,600 new jobs in Florida by 2016. Some workers would be hired from the pool of available labor, but the ISRP would also be a magnet for new workers to relocate from other regions or states. The ISRP Target Market Assessment and Forecast study found that 18 of the 20 primary organizations that completed interviews described their interest in the ISRP in terms of a company expansion. Four of the organizations, three from the local area and one from out-of-state, would relocate an existing facility to be in closer proximity to KSC. Assuming that workers moving to Brevard County or an adjacent county would fill 50 percent of the new jobs, and assuming that 50 percent of those workers would come with their families, development of the ISRP would increase Brevard County's population by an additional 20,000 persons. Those new residents would represent a net population increase of 0.9 percent to Brevard County in 2016, and 0.3 percent for the 5 adjoining counties.

4.7.5 Housing

4.7.5.1 No Action Alternative

Brevard County currently absorbs about 3,800 new housing units per year. The county is projected to experience a 33 percent increase in number of households between 2000 and 2015, slightly lower than the growth rate in adjoining counties. The No Action Alternative would create no additional impacts to the housing market or property values in Brevard County or the surrounding counties.

4.7.5.2 Alternative 1 (Phases A-E), Alternative 2 (Phases A-E), and Phase F

Development of the ISRP would create new jobs and, as a result, demand for new housing. New residents drawn in by the ISRP would require about 450 new housing units per year in Brevard County (totaling about 5,450 new units by 2016). An additional 600 units would be required each year in the adjoining counties (totaling an additional 7,250 housing units). These housing units represent an increase of 12 percent over the No Action Alternative. This increase in housing would help maintain a strong real estate market in Brevard County. This increase in housing is consistent with growth and development planning within Brevard and adjacent counties.

4.7.6 Social Conditions

4.7.6.1 No Action Alternative

In 2001-2002, Brevard County had 38,112 students enrolled in elementary schools, 12,491 in middle schools, and 20,323 in high schools. Although no projections for school enrollments were found, enrollment figures can be extrapolated from projected growth in population and number of households. If school enrollment grew at the same rate as population and the number of households grow, school enrollment would increase by 33 percent resulting in 12,500 more elementary school students (about 21 new schools), 4,100 more middle school students, and 6,700 more high school students. Strong population growth and the influx of new residents are expected to impact the social fabric of the community. The No Action Alternative would not create any additional impacts to social conditions in Brevard County or the surrounding counties, which includes school enrollment, school district funding, county or municipal expenditures, or crime rates.

4.7.6.2 Alternative 1 (Phases A-E), Alternative 2 (Phases A-E), and Phase F

As discussed in the previous sections, development of the ISRP would create new jobs, new housing units, and, as a result, increased demand for community and social services. In particular, assuming at full build-out 50 percent of the new workers moving to Brevard County came with school age families, school enrollments would increase by an additional 4 percent. This represents about 550 elementary school students (one additional new school) and 450 middle and high school students at full build-out of the ISRP. The proposed influx of new residents is high, but 4 percent is below the 10 percent threshold of significance to have a significant impact on the social fabric of the community. Future development of the ISRP would be phased, and thus reduce impacts in any one year.

4.7.7 Environmental Justice

4.7.7.1 No Action Alternative

As discussed in Section 3.7, KSC developed an Environmental Justice Plan that identified possible off-site environmental impacts to low-income and minority populations, including potential impacts from hazardous substances or chemical releases, air emissions, hazardous or non-hazardous wastes, wastewater, and noise. KSC identified no existing activities and programs that might have a substantial environmental effect beyond the KSC boundaries. The No Action Alternative would not cause any impacts to low income or minority populations in Brevard County or municipalities near KSC.

Under Executive Order 13045, Protection of Children From Environmental Health Risks and Safety Risks, (dated 13April 21, 1997, Federal agencies are encouraged to consider potential impacts of proposed actions on children. The No Action Alternative would not impact children.

4.7.7.2 Alternative 1 (Phases A-E), Alternative 2 (Phases A-E), and Phase F

Development of the ISRP would increase employment at KSC, resulting in an increase in population and school enrollment growth rates, and vehicle traffic to KSC over the No Action Alternative. Three near-by municipalities (City of Cocoa, Oak Hill, and Mims CDP) have a larger portion of residents living below the poverty level than the State average or the average in other nearby communities. The environment at KSC is influenced by NASA operations, land management practices, vehicle traffic, and emission sources outside of KSC. Increased traffic would affect local air quality, but the impacts would be dispersed. Based on the most current information available, development of the proposed ISRP would not adversely affect people living in these lower income areas, thus there would be no disproportionate impact to any low income or minority population.

Chapter 2, Section 2.2, Baseline Conditions, and socio-economic conditions in Section 3.7, present current and projected economic activities and planned or proposed development around KSC. These projected economic activities, along with the proposed development of the ISRP, were considered in the cumulative impact analysis. No other development projects that would stimulate economic or population growth were identified. Development of the ISRP, when combined with projected economic growth, would have minimal cumulative impacts to socio-economics or environmental justice concerns. Significant impacts were not identified, therefore no mitigation measures are proposed.

Under Executive Order 13045, Protection of Children From Environmental Health Risks and Safety Risks, dated 13April 21, 1997, Federal agencies are encouraged to consider potential impacts of proposed actions on the safety or environmental health of children. The proposed ISRP is not located in the vicinity of schools, daycare facilities, playgrounds, or other places

where children are concentrated and is not proposed to include any such facilities or activities. Thus, neither Alternative 1 (Phases A-E), Alternative 2 (Phases A-E) nor Phase F would be expected to affect children.

4.7.8 Transportation

4.7.8.1 Standards of Significance

Development of the ISRP would have a significant impact with regard to transportation if it would:

- Substantially impact or alter, over time, transportation of service standards within KSC and the surrounding area.
- Result in a violation of a law, code, or ordinance regulating roadways or traffic flow.

4.7.8.2 Impact Discussion

Analysis of the traffic impacts to the roadway network accessing KSC created by the proposed ISRP development revealed that the additional traffic generated by the construction and operation of the ISRP does not create any critical violations of traffic level of service standards (Motorist Design 2003; Appendix H). As the action alternatives are both in the same general vicinity, off-site impacts to the surrounding roadway network would be equal for Alternative 1 (Phases A-F), and Alternative 2 (Phases A-F) and therefore are addressed together.

SR 3 (N. Courtenay Parkway) between SR 528 and Hall Road will reach critical levels in the full build-out horizon year (2022) based upon the FDOT Generalized Tables, but more data intensive, site specific analysis reveals sufficient capacity would be available along the corridor due to the limited number of signalized intersections on this segment and low traffic volumes on side streets.

In order to maintain acceptable levels of service in the 2022 post-development scenario, with the existing roadway geometry, the traffic signal timing at the existing intersection of SR 3 and Hall Road would need to be increased to unusually long cycle lengths. An alternative to the long cycle lengths would be to add, as a minimum, an exclusive right turn on westbound Hall Road to accommodate northbound right turning vehicles. Additional environmental analysis would be conducted if these measures were later proposed.

No impact to regional air transportation is expected as a result of the proposed ISRP. It is anticipated that Orlando International Airport would remain a primary source of air transport for passengers because it offers a full suite of commercial airlines. The Space Coast Regional Airport offers some industrial and business air transportation resources within 5 miles of KSC; however, this facility is not expected to see a significant increase in air traffic as a result of ISRP operations. Air traffic requirements for support of the proposed ISRP would not significantly impact any area transportation.

4.7.9 Public and Emergency Services

Public and emergency services would be provided to the ISRP and its tenants as reimbursable services through the proposed ISRP Authority, NASA KSC, Brevard County, municipalities, or contractor. The public and emergency services needed are not anticipated to have an impact on any service provider.

Regarding potable water consumption, the proposed project would use, at build-out an estimated 3.0 million liters per day (800,000 gallons per day) of this resource. For comparison, KSC uses an average of 4.9 million liters per day (1.3 million gpd) with a maximum daily average usage of 8.3 million liters (2.2 million gal). KSC obtains this resource under a service contract with the City of Cocoa, Florida, which provides for an estimated daily consumption of 9.4 million liters per day (2.5 million gpd) and an estimated daily maximum of 14.1 million liters per day (3.75 million gpd). Therefore, the increase of potable water required is well within the estimated daily consumption of the KSC permit. Therefore, the impact to water availability is not considered significant.

4.7.10 Recreation

This section identifies potential impacts on active and passive recreational land uses and opportunities, as defined in Section 3.7.16, from each of the three alternatives, including the No Action Alternative. For the purpose of analyzing impacts to recreation, there is no appreciable difference between the Alternative 1 (Phases A-F) and Alternative 2 (Phases A-F) locations. Therefore, evaluation of these two alternatives has been combined.

4.7.10.1 Standards of Significance

Development of the ISRP would have a significant impact on recreational land uses and opportunities at KSC and in the surrounding region of influence, defined as an approximate 16 km (10 mi) radius from ISRP alternative sites, if it would:

- Impact the quality of existing passive nature-based recreation resources (outdoor conservation areas and parks) and education-based opportunities (KSC Visitor's Center, space and aeronautical museums) located outside of the KSC security areas by substantially increasing visitor use by people working at the ISRP.
- Substantially reduce the amount of active recreational facilities (active sports parks and gyms) available at KSC and locales outside of the KSC security areas due to increased use by people working at the ISRP.

4.7.10.2 Impact Discussion

This section evaluates the significance of potential impacts to recreational resources from implementation of the ISRP development action under the three alternatives.

4.7.10.2.1 No Action Alternative

Under the No Action Alternative, no change would occur in baseline quantity and quality of active and passive recreational resources at KSC and surrounding locale because there would be no new development.

4.7.10.2.2 Alternative 1 (Phases A-E), Alternative 2 (Phases A-E), and Phase F

Nature-based passive recreational resources are abundant outside of the KSC security areas and within the ISRP area of influence. These resources include, for example, the 56,500 ha (139,490 ac) MINWR that receives 500,000 visitors annually (USFWS 2003) and the 900± acre Pine Island Conservation Area (PICA), a designated birding site along the Great Florida Birding Trail. The entrance to PICA, which is managed by the Brevard County Environmentally Endangered Lands (EEL) Program, is located less than 6.4 km (4 mi) from the ISRP alternative sites. Both of these natural areas offer a wide variety of passive recreation and environmental

education opportunities including hiking trails dotted with panoramic vistas, canoe and kayak trails, biking trails, and wildlife viewing opportunities. Enhanced environmental education opportunities and self-guided hiking trails are provided at the EEL Program's flagship sanctuary, the Enchanted Forest Sanctuary located about 9.6 km (6 mi) west of the ISRP alternative sites. Impacts to the quality of these nature-based passive recreational resources from increased visitor use resulting from implementation of the ISRP would not be considered significant due to the large capacity of and sound visitor management practices employed at each of these passive recreational resources.

Space and aeronautical-based educational recreation opportunities also abound within the ISRP area of influence. Three museums (the U.S. Hall of Fame, the Valiant Air Command Warbird Museum, the U.S. Air Force Space and Missile Museum) and the Kennedy Space Center Visitors Complex provide excellent educational opportunities. The potential for substantial impacts to these recreational opportunities from the ISRP would not be considered significant given the large capacity of and sound visitor management practices employed at these facilities.

The proposed ISRP design concept employs the creation of a physical pedestrian link between the existing SERPL and proposed ISRP (ULI 2001). This pedestrian link is envisioned to consist of paved walkways extending into a planned central greenway (ULI 2001). Therefore, the link could provide ISRP employees with an excellent opportunity for daily exercise, for example, from walking or jogging. Formal gym facilities are not initially proposed under the ISRP Concept Plan (ULI 2001). Impacts to existing gyms within the secured area of KSC from increased use by ISRP employees is not considered a significant concern, since many ISRP employees would not likely be authorized to enter KSC secured areas.

Brevard County Parks and Recreation is planning to open Mitchell Ellington Park Sports Complex in 2004, a project, which may serve to reduce future potential impacts from shortages of active recreational opportunities. This 32 ha (80 ac) active sports park is located on SR 3, at Hall Road, approximately 8 km (5 mi) south of the ISRP alternative sites. Planned active recreation facilities include tennis courts, baseball, soccer, and football fields and a pedestrian trail (Brevard County 2003). In consideration of this planned active recreation resource within the ISRP area of influence and expected limited use of existing KSC gym facilities by ISRP employees, significant impacts to or shortages of recreational resources from ISRP development would not be considered significant.

4.7.10.3 Impacts and Mitigation Measures

No significant impacts to recreational resources were identified; therefore, mitigation measures are not proposed.

4.7.11 Cumulative Impacts

This section considers the impacts on the environment, which would result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR §1508.7). The cumulative projects being considered under this analysis are listed in Chapter 2 Section 2.2 Baseline Conditions. Development within the area is generally expanding and no cumulative impacts related to land use, overall zoning, and land management objectives have been identified as a part of the proposed ISRP development.

Regarding development contemplated in the NASA long term planning documents, given the speculative nature of these plans, it is difficult to quantify the effects the implementation of the plan would have on KSC and the surrounding environs. However, the Cape Canaveral

Spaceport Master Plan addressed three planning horizons; 30 years, 50 years and 75 years. Given the expected build out of 20 years for the ISRP, it is appropriate to address the expected effects of the 30-year planning horizon of this plan.

As the bulk of the changes in the 30-year horizon are encompassed in the ISRP levels, the largest impact to socioeconomic factors at KSC is the projected increase in tourism. The Master Plan indicates this industry could increase by as much as 25% if there are no major economic down turns. This would have a significant impact on the economic health of the county and the region causing the need for increased number of services such as hotel rooms and retail stores. This would result in an increase in jobs and a related need for additional housing, schools and other support infrastructure throughout the county.

4.8 CULTURAL RESOURCES

4.8.1 Standards of Significance

Development of the ISRP would have a significant impact with regard to cultural resources if it would:

- Substantially impact or alter, over time, important archeological or historical resources within the proposed action alternatives, which are listed, determined eligible, or considered potentially eligible for listing in the NRHP.
- Resulted in a violation of a law, code, or ordinance protecting or regulating cultural resources.

4.8.2 Impact Discussion

A Cultural Resources Assessment Survey (CRAS) was conducted to investigate cultural resources within the Alternative 1 (Phases A-F), Alternative 2 (Phases A-E), and the Phase F parcel (ACI 2003; Appendix I). Background research indicated an absence of previously recorded archaeological sites and historic structures within or adjacent to the project area. Previous predictive model survey of KSC indicated that a portion of Alternative 2 (Phases A-E) had a moderate potential for archaeological site location; Alternative 1 (Phases A-E) and the Phase F parcel were considered to have a low potential.

Field survey efforts focused upon the moderate probability zone; other areas were archaeologically sampled. As a result, one new archaeological site was discovered within Alternative 2. This single artifact site (8BR1850) is not considered eligible for listing in the NRHP but would be protected under the Archeological Resources Protection Act (ARPA) from excavation or looting. No historic structures are contained within or adjacent to the Alternative 2 (Phases A-E) site. Historical research indicated that the citrus groves within Alternative 1 (Phases A-E) and the Phase F parcel, at least in part, may date back as far as 1885. However, the citrus groves appear to be unassociated with any persons or events significant in local, regional, or state history.

Development of the proposed ISRP on Alternative 1, Alternative 2 and the Phase F parcel would have no impact on any archaeological sites or historic resources, which are listed, determined eligible, or considered potentially eligible for listing in the NRHP (ACI 2003).

4.8.3 Cumulative Impacts

This section considers the impacts on the environment, which would result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR §1508.7). The cumulative projects being considered under this analysis are listed in Chapter 2 Section 2.2 Baseline Conditions. Development within the area is generally expanding and no cumulative impacts related to land use, overall zoning, and land management objectives have been identified as a part of the proposed ISRP development.

Regarding development contemplated in the NASA long term planning documents, given the speculative nature of these plans, it is difficult to quantify the effects the implementation of the plan would have on KSC and the surrounding environs. However, the Cape Canaveral Spaceport Master Plan addressed three planning horizons; 30 years, 50 years and 75 years. Given the expected build out of 20 years for the ISRP, it is appropriate to address the expected effects of the 30-year planning horizon of this plan.

As the proposed development envisioned within the Master planning documents are mostly within the ISRP and the KSC Industrial Area, there are no significant impacts expected from the implementation of the long-term development.

4.8.4 Impacts and Mitigation Measures

Potential impacts to significant cultural resources were not identified, therefore mitigation measures are not proposed. If during construction, human remains are inadvertently discovered, construction would be stopped until an archeologist can evaluate the significance of the findings and the notification and consultation requirements specified in 43 CFR Part 10.4, which implement the Native American Graves Protection and Repatriation Act (NAGPRA), and Chapter 1A-44, Florida Administrative Code, which implements Chapter 872, FS are followed.

4.9 RELATIONSHIPS AND COMMITMENT OF RESOURCES

In accordance with CEQ regulations (40 CFR §1502.16), the analysis of the environmental consequences of a proposed action also requires the consideration of any adverse effects of the action that are unavoidable and the relationship between the short-term uses of the human environment and the maintenance and enhancement of long-term productivity, and any irreversible or irretrievable commitments of resources. Unavoidable impacts of the proposed action are discussed above for each resource. The primary unavoidable impact is associated with loss of habitat required for ISRP infrastructure and facilities development.

4.9.1 Short-Term Uses of The Human Environment and the Maintenance and Enhancement of Long-Term Productivity

Under NEPA the evaluation of short-term impacts address possible conflicts with the objectives of Federal, State, and local land use plans and policies or private party plans for the affected area. To further define this analysis, the definitions of short-term and long-term uses of the environment are based on the scope of the proposed ISRP development action. Short-term use of the environment, as it relates to the proposed action, would encompass the construction period. Long-term productivity is associated with the operation of the ISRP facilities.

The proposed ISRP development project would not be in conflict with any objectives of Federal, State, local or private party land use plans. The project would be developed in full compliance with applicable executive orders and Federal, State, and local environmental laws and regulations as set forth in Chapter 2.

During construction of the proposed ISRP, localized environmental disruption, in the form of habitat loss and potentially significant impacts to listed wildlife species, as quantified in Section 4.6.2 above, are expected. The significance of these impacts would be substantially less under the Alternative 1 (Phases A-F) (Section 4.6).

In the long-term, under the Alternative 1 (Phases A-E), the loss of current income from production of citrus in the southern section of the development site would be considered negligible to the annual working budget of MINWR and KSC. The citrus groves located on the northern half of Alternative 1 (Phases A-E) site and the Phase F parcel are currently fallow. Additionally, NASA and MINWR are striving to remove citrus production from their shared boundaries by 2008. The financial and staff resources required to restore these groves, in the long-term, to native hydric hammock conditions which are suitable for dependent species use would be substantial. The resulting benefits of the restoration effort to local and regional species sustainability would be minimal. Hammocks are important habitat but are not locally rare. Hammock restoration within an area that has been in citrus production for approximately 100 years has a very low probability of success. Successful restoration is a very long-term commitment requiring more than 30 years to reach maturity. On MINWR, the money and effort for restoration of scrub habitat would bring the greatest species benefit, not hammock. (V. Larson, personal communication).

Under Alternative 2, the ISRP project has a high potential to significantly impact the long-term recovery of the federally protected Florida Scrub-jay population at KSC (see Section 4.6.2.3 for further discussion of this impact).

The implementation of the ISRP under Alternative 1 (Phases A-F) would allow NASA to use underutilized and abandoned citrus groves for purposes directly related to NASA's mission of R&D in space exploration and education while preserving the lands as part of the KSC buffer. At the end of the lease and any extensions, the State of Florida through the FSA and ISRPA, would demolish the buildings and infrastructure and transfer restored land to KSC.

4.9.2 Irreversible and Irretrievable Commitment of Resources

Under NEPA, the evaluation of the commitment of the proposed action on irreversible and irretrievable resources should consider the use of nonrenewable energy resources, natural and depletable resources, and scarce materials and the conservation potential of the alternatives under evaluation, including associated mitigation measures.

An irreversible commitment of resources is one that cannot be restored or returned to the original condition within a reasonable time frame (e.g., faunal collapse). An irretrievable commitment of resources involves the loss in value of an affected resource for a period of time (e.g., citrus production). It also considers the effects that the uses of these resources would have on future generations.

The majority of the irreversible and irretrievable resources that would be committed to development of the ISRP is typical of an urban development project and includes building materials that are drawn from natural resources and consumption of petroleum, oil and lubricants. These new facilities would follow sustainable design standards as provided for in the Florida State Building Codes and the proposed Design Standards Manual under which this development activity would occur. Operation of the facilities would require consumption of nonrenewable energy resources. The commitment of these resources would have no significant adverse impact on the environment or on future generations.

Under Alternative 1 (Phases A-F), the loss of existing citrus production, as discussed above, would be considered an irretrievable commitment of resources, however, the impacts are negligible.

Under Alternative 2 (Phases A-F), the potential loss of a significant Florida Scrub-jay population would be considered a significant irreversible commitment of resources, one that could potentially jeopardize the recovery potential of this species on KSC.

4.9.3 Summary of Cumulative Impacts

This section considers the impacts on the environment, which would result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR §1508.7). The cumulative projects being considered under this analysis are listed in Chapter 2 Section 2.2 Baseline Conditions. Development within the area is generally expanding and no cumulative impacts related to land use, overall zoning, and land management objectives have been identified as a part of the proposed ISRP development.

Regarding development contemplated in the NASA long term planning documents, given the speculative nature of these plans, it is difficult to quantify the effects the implementation of the plan would have on KSC and the surrounding environs. However, the Cape Canaveral Spaceport Master Plan addressed three planning horizons; 30 years, 50 years and 75 years. Given the expected build out of 20 years for the ISRP, it is appropriate to address the expected effects of the 30-year planning horizon of this plan.

Most of the expected development for these activities would occur either within the ISRP or KSC Industrial Area, an area designated for development and not managed for wildlife or in the KSC Visitors Complex. Given these facts, the overall cumulative effects of these activities are considered minimal to land use on KSC.

Changes in air quality that may occur from the proposed development of the ISRP and other development on KSC are not expected to have a significant negative impact on Brevard County or regional air quality. However, the impacts to local air quality, that is, the KSC area, would be significant. These come from not only the development of the ISRP but include the increased tourist activities and increased population in the KSC Industrial Area. Therefore, it is safe to say that for planning horizon 1 the cumulative effects of full build out under this scenario would produce significant impacts to local air quality.

The cumulative impacts of increased noise within KSC, as a result of the ISRP development and other actions associated with the 30 year planning horizon, would not result in a significant cumulative impact. The effects of localized noise on animal species are discussed in Section 4.6 Biological Resources.

As the impacts to geology and soils from all contemplated actions within the 30-year planning horizon would most likely occur in either the ISRP or the KSC Industrial Area, they will fall within areas already slated for development and not affect adjacent lands. These cumulative effects then are very localized and are considered unavoidable.

Increased vehicle traffic has the potential to add pollutants to surface water and groundwater through atmospheric deposition processes and runoff from roads and impervious surfaces (Table 4-4). Other sources of pollutants include fossil fuel combustion. Vehicles associated with the construction and operation of the proposed ISRP would not significantly increase pollutants in surface water or ground water.

Construction of the proposed ISRP and additional projects within the KSC Industrial Area would increase the percentage of impervious surface area within its watershed. This increase in impervious surface area can decrease surgical aquifer recharge. Because a large proportion of the “Prime Recharge” and “Good Recharge” areas of KSC remain undeveloped (or lack extensive impervious surfaces) the cumulative effects of reduced surgical aquifer recharge would not be significant.

Cumulative impacts to biological resources resulting from implementation of the ISRP and other long term development would be similar to those for the ISRP alone as most of the additional predicted development would be within the KSC Industrial area which is largely developed or not actively managed for these resources.

As the bulk of the changes in the 30-year horizon are encompassed in the ISRP levels, the largest impact to socioeconomic factors at KSC is the projected increase in tourism. The Master Plan indicates this industry could increase by as much as 25% if there are no major economic down turns. This would have a significant impact on the economic health of the county and the region causing the need for increased number of services such as hotel rooms and retail stores. This would result in an increase in jobs and a related need for additional housing, schools and other support infrastructure throughout the county.

As the proposed development envisioned within the Master planning documents are mostly within the ISRP and the KSC Industrial Area, there are no significant impacts expected from the implementation of the long-term development.

4.9.4 Consistency with other Approved Plans

KSC is within the Coastal Zone as defined by Florida Statutes (15 CFR 930.30-44). As such, a Coastal Zone Consistency Determination is required (FDER 1984). The results of the analyses undertaken within this EIS indicate that the proposed action can be implemented within existing environmental regulations and has been determined to be consistent with the Florida Coastal Zone Management Plan.